RAILROAD GAZETTE

FRIDAY, JULY 3, 1903.

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The Seasoning of Tie Timber.*

BY HERMANN VON SCHRENK.

It is generally supposed that trees contain less water in winter than in summer. This is evidenced by the popular saying that "the sap is down in the winter." This is probably not always the case. Some trees contain as much water in winter as in summer, if not more. The average weight of Lodgepole Pine ties of the same size cut at Bozeman, Mont., in June, 1902, was 157 lbs.; in July, 144 lbs.; in August, 150 lbs.; in September, 157 lbs.; in October, 164 lbs. It is probable that this increase would keep up throughout the winter.

Of the varying amounts of water in the trees of one region during the same period of different years, little or nothing is known. It is hoped that the tests now in progress will give some indications in that direction. When exposed to the sun and air the water in green wood rapidly evaporates. The rate of evaporation will depend on the kind of wood, the shape of the timber, and the conditions under which the wood is placed. Pieces of

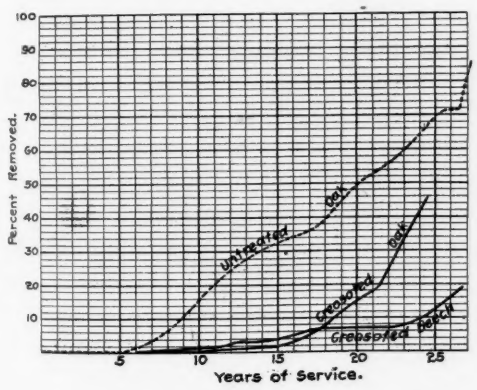


Fig. 1.

wood completely surrounded by air, exposed to the wind and the sun, and protected by a roof from rain and snow, will dry out very rapidly; while wood packed close together, so as to exclude the air, or left in the shade and exposed to rain and snow, will probably dry out very slowly.

But seasoning implies other changes besides the evaporation of water. Although we have as yet only a vague conception as to the exact nature of the difference between seasoned and unseasoned wood, it is very probable that one of these consists in changes in the albuminous substances in the wood fiber, and possibly also in the tannins, resins, and other incrusting substances. Whether the change in these substances is merely a drying out, or whether it consists in a partial decomposition, is as yet undetermined. That the change during the seasoning process is a profound one there can be no doubt, because experience has shown again and again that seasoned wood fiber is very much more permeable, both for liquids and gases, than the living, unseasoned fiber. One can picture the albuminous substance as forming a coating which dries out and possibly disintegrates when the wood dries. The drying out may result in considerable shrinkage, which may make the wood fiber more porous. It is also possible that there are oxydizing influences at work within these substances, which result in their disintegration.

Whatever the exact nature of the changes may be, one can say without hesitation that exposure to the wind and air brings about changes in the wood which are of such a nature that the wood becomes drier and more permeable. When seasoned by exposure to live steam, similar changes may take place. The water leaves the wood in the form of steam, while the organic compounds in the walls probably coagulate or disintegrate under the high temperature.

MANNER OF EVAPORATION OF WATER.

The evaporation of water from timber takes place largely through the ends, i.e., in the direction of the longitudinal axis of the wood fibers. The evaporation from the other surfaces takes place very slowly out of doors; with greater rapidity in a kiln. The rate of evaporation differs both with the kind of timber and its shape. Thin boards and beams dry faster than thicker ones; sapwood dries faster than heartwood, and pine more rapidly than oak. Tests made during the past summer showed little difference in the rate of evaporation in sawed and hewn ties, the results, however, not being conclusive. Air-drying out of doors takes from two months to a year, the time depending on the kind of timber and the climate. No data have been obtained as to the rate of evaporation out of doors. This is one of the questions now under investigation.

SEASONING AND THE LEACHING OF SALTS.

Where timber is chemically treated with salts dissolved in water, it will be absolutely necessary to season it after the treating process, for two reasons: First, to prevent the rapid leaching out of the salts pressed into the wood; second, to prevent subsequent decay. The practice, unfortunately in vogue in many cases, of placing timber treated with a water solution in positions where it comes in contact with water, cannot be condemned too strongly. In the case of ties, the leaching out of salts takes place with startling rapidity when they are laid immediately after treatment.

A crude test was made with several Lodgepole Pine ties for the purpose of giving at least a partial indication of the different rates at which zinc chlorid leaches out from treated ties with and without seasoning after treatment. Two ties were taken—one which had dried for three months, the other fresh from the treating cylinder. The calculated amount of zinc chlorid in each was about 24 ounces. After 24 hours soaking it was found that the seasoned tie had lost 3 ounces of zinc chlorid (calculated from the amount of zinc chlorid in the water), while the newly treated tie had lost 5.5 ounces, or almost twice as much. Stating these figures in another way, the seasoned tie had lost in 24 hours about one-eighth of the salt injected, and the freshly treated tie about one-fourth of its salt.

A test which gives more reliable figures was conducted as follows: A number of Lodgepole Pine ties were treated with zinc chlorid, and the amount of salt absorbed was determined by weighing the tie before and after treatment. The ties were then sawed in half. One-half of each tie was placed in water for 24 hours, at the end of which period the amount of salt leached out was determined and the half ties allowed to dry for 24 hours, after which they were again submerged. This process was kept up for several days. The second half of each tie dried until air-dry, and was then alternately submerged and dried just as the first halves had been, the amounts of salts leached out being determined after every leaching. The results obtained show that one-quarter more salts were leached from the freshly treated halves than from the seasoned halves.

SEASONING AND THE PROCESSES OF PRESERVATION.

The question of the relation of the water content of timber to the various treating processes has so far received but little attention in this country. The subject is one of the greatest importance, for much of the ultimate success of most forms of timber treatment depends upon the amount of water in the wood before treatment. Mr. O. Chanute and others have repeatedly urged the absolute necessity for thorough seasoning of timber before treatment with zinc chlorid. The success of timber treatment depends upon a series of factors entirely apart from the mere impregnation of the wood with one substance or another, and the sooner it is realized that the actual treatment is only one small part in the operations tending to obtain increased length of life, the better it will be.

The object of timber treatment is to get certain chemical compounds into the wood with as much thoroughness as possible. Because of its peculiar structure, wood will not allow of the penetration of liquids into its mass as does a sponge. The solution must work its way into the wood fibers through walls of wood substance. If a water solution is used for the impregnating material, it ought to fill every cell and permeate every wall, at least in the sapwood. The most successful method for timber treatment (excepting the boiling process) so far used consists in pressing the solution into the wood. If the wood cells and the walls are already full of water, it is easy to see that there will be great difficulty in making the water already in place give way to the solution. When walls and cell cavities are free from water the process of absorption of a solution is facilitated by the readiness with which the capillary forces operative in wood fiber aid the absorption. Nor is this all. Seasoning not only brings about a reduction in the amount of water, but also results in the partial disintegration of the albuminous substances which offer more or less resistance to the entrance of solutions. The steaming of wood before the injection of the solution can never replace seasoning as a means of preparation for treatment, for at best it does no more than drive off part of the water.

When the substance used is ordinary creosote or tar oil, the matter of seasoning is still more important. At the present time there are several plants in operation where green or watersoaked wood is steamed in a cylinder for varying lengths of time and then treated with tar oil, which is run in after the formation of a vacuum. The reason given for this method of operation is that just as effective a penetration of the tar oil is secured at a lower cost, since the timber does not have to be held until it is seasoned. An extended discussion of this subject is reserved for another report. It is enough to say now that tar oil and water do not mix, and that a porous medium entirely or partially filled with water will not become so thoroughly penetrated as one which is dry. Dry wood fiber absorbs tar oil with great readiness, as anyone can prove who will pour tar oil into the ends of two pieces of wood, one dry and one moist. To the claim frequently made that wood when steamed is absolutely dry, one may answer that such is indeed true when the temperature is raised sufficiently high to reach to the very center of the piece of wood treated, but such temperatures are frequently so high that the wood fiber itself is materially injured.

The experience of the European railroads and other consumers of treated timbers is so very conclusive that it seems almost needless to contend for a careful seasoning of timber before treatment. The great objection made against it is the time required. The risk taken when timber is held, as well as the interest on the investment, is sometimes considerable; but it is believed that the tests already made and those in progress will serve to show that in the long run the saving from better service far exceeds the cost.

Another consideration of decided importance is the time required for the treatment. No definite data are yet at hand which will admit of a fair comparison, but it is a matter of experience that the length of time necessary to treat seasoned wood with any of the ordinary preservatives is very much shorter than for unseasoned. Careful tests are now in progress with Lodgepole Pine, and similar tests will be made with other timbers this year.

If, therefore, we take into consideration the greater thoroughness with which timber can be treated after ample seasoning, as well as the larger amount which can be treated in a given time, it would appear that any treatment which does not accurately specify that all wood must be thoroughly seasoned before treatment with zinc chlorid, tar oil, or both, or any combination which contains salts,

Fig. 2.

should be regarded with disfavor. It is claimed for several processes, notably for the Hasselmann and the electrical treatments, that green wood can be treated as well as seasoned wood. Should this prove true, the objections made to the ordinary methods of treatment would not apply to them.

One of the first questions to arise when we consider the substitution of Red and Swamp Oak for White Oak, Loblolly Pine for Longleaf Pine, or Hemlock and Tamarack for oak and pine, is, What shall be done to these timbers so as to get the maximum value out of the investment? The crux of the situation is the comparative lasting powers of the various timbers. That which applies to ties holds true also for telephone and telegraph poles, fence posts, bridge material, etc.; in short, for all timbers which are exposed to decay. It is believed that, by proper treatment, timbers which otherwise could not be used for the purposes specified above can be made to serve longer than the untreated timbers in use up to the present time.

The relative ease with which so-called high and low grade timbers can be treated is another matter requiring consideration. As a rule, high-grade timbers—Longleaf

*Bureau of Forestry Bulletin No. 41.

Pine or White Oak, for instance—are very much denser than the lower grades, such as Loblolly Pine or Red Oak. The latter generally have a higher percentage of sapwood, which can be penetrated by a treating fluid very much more readily than heartwood. On account of this greater porosity it is very much more economical to treat a porous wood thoroughly with a good preservative than to treat a more expensive denser wood with a cheaper preservative. The cheap and porous wood well treated will outlast the other in every instance. Fig. 1 shows this graphically. The short-lived, porous Beech, which ordinarily lasts but four to five years, has outlasted the Oak several times

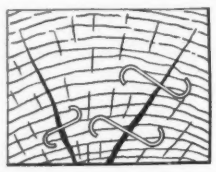


Fig. 3.

over. It would be a great waste, therefore, to attempt the treatment of White Oak or Longleaf Pine when better results will be obtained by using Loblolly Pine or Red Oak.

One of the first steps in the process of making short-lived timbers fit for treatment consists in a proper seasoning. More benefit will result from taking care of the short-lived timbers than from similar treatment of those with longer life. The former are frequently short lived because of their greater porosity, which may mean a higher water content, and which always means a greater power of absorbing and holding water. The economical substitution of cheap for high-priced timbers is impossible without proper seasoning. The loss from the shortened term of service of unseasoned timber is very much greater in the case of porous than of the denser kinds, which are much less permeable by water, and consequently offer greater resistance to decay. Susceptibility to decay in timber is a consequence both of relatively high porosity, which may mean a high water content, and always means a greater absorptive power, and of a large percentage of sapwood, which furnishes, by its stores of organic matter, food for wood-destroying fungi. Seasoning greatly lengthens its life, because it rids it as far as possible of its water and brings about a disintegration of much of the organic matter, in both ways lessening the chances for destruction of the wood by its fungus enemies. Seasoning is therefore of the first importance for the utilization of cheap timbers hitherto regarded as short-lived.

PREVENTION OF CHECKING AND SPLITTING.

Under present methods much timber is rendered unfit for use by improper seasoning. Fig. 2 furnishes a good example of this. Green timber, particularly when cut in the fall or winter, contains a large amount of water. When exposed to the sun and wind the water will evaporate more rapidly from the outer than from the inner parts of a log, and more rapidly from the ends than from the sides. As the water evaporates, the wood shrinks, and when the shrinkage is not fairly uniform the wood cracks. When wet wood is piled in the sun, as were the ties shown in Fig. 2, evaporation goes on with such unevenness that the timbers split and crack so badly as to become absolutely useless. Such uneven drying can be prevented by careful piling. A very large number of ties and timbers split from this cause are thrown out of use every year, and it is time that more attention were given to prevent this waste.

In Europe many railroads use S irons, which are driven into the ends of timbers in danger of splitting, and effect a great saving. Fig. 3 shows such irons, and the manner of application.

KILN DRYING.

As kiln drying is employed mostly to prevent the warping and checking of wood, and only rarely to prevent decay, it is not necessary to dwell at length upon this method of seasoning. In the Southern States it is often used to prevent the development of the blue fungus during the spring, when the percentage of moisture in the air is very great.

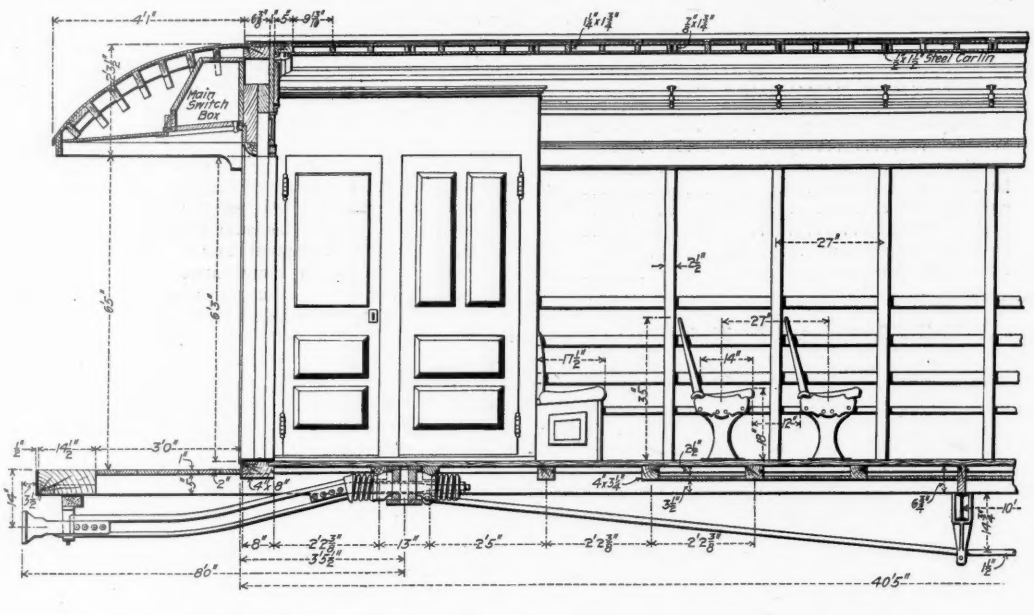
(To be continued.)

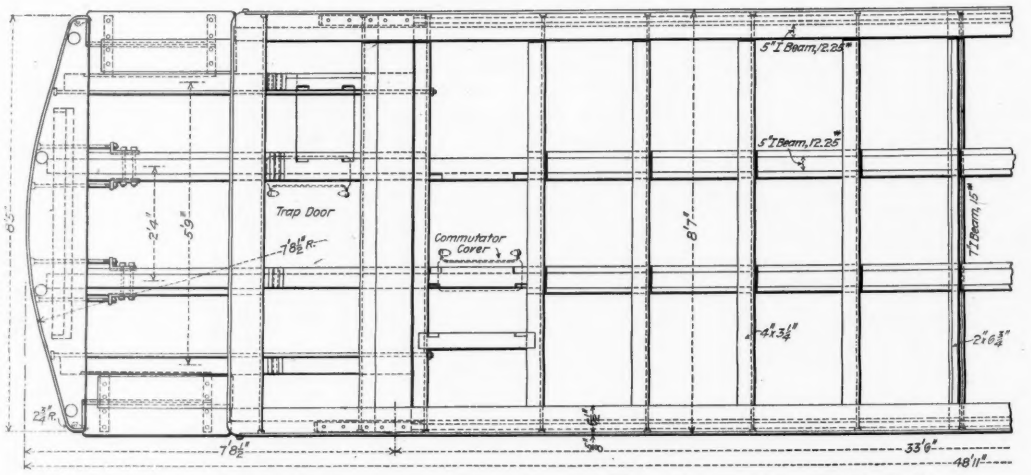
Open Elevated Motor Car—Brooklyn Heights Railroad.

The Brooklyn Heights Railroad Company, which operates the Coney Island and Bay Ridge elevated lines of the Brooklyn Rapid Transit Company, has received from the John Stephenson Works, 100 open elevated motor cars of the center aisle type with cross seats. These cars are built with steel underframes sheathed with wood filling pieces. The longitudinal sills are 5 in. I-beams with wood fillers. The two outside sills extend the length of the car body only, the two center sills running through the end sill to the buffer beam. Oak floor beams 3¼ in. x 4 in. rest on these I-beam sills and two 7 in. I-beams are used for cross ties. A truss plank 1¾ in. thick x 12 in. high runs the length of the car body on each side and is gained around the side posts. These side posts are 2½ in. x 3½ in., and are spaced 27 in. apart from center to center, except at the ends of the car, where at one end there is a cab for the motorman and at the other end a double cab for the motorman and the controlling apparatus.

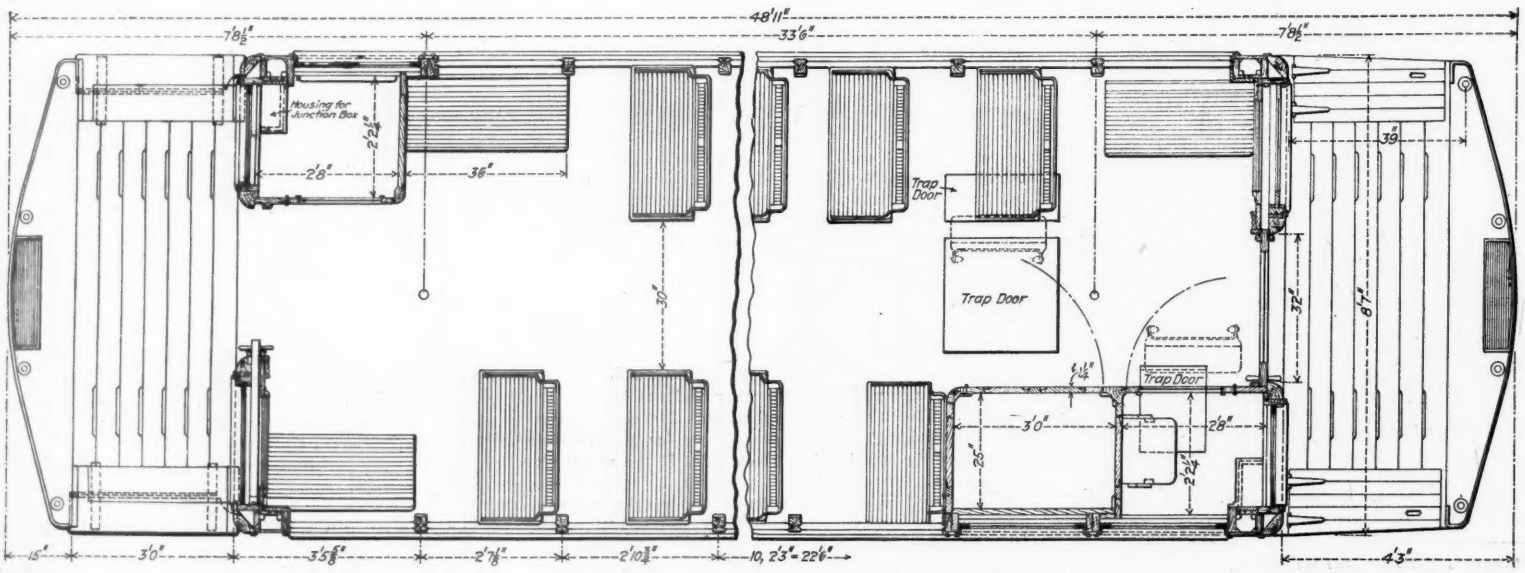
The roof is of the turtle back type without a clear story, but there is an imitation clear story built up inside. The roof framing is made up of steel and wooden carlines, and a single piece of No. 6 cotton duck is used for the roofing material. The trolley board runs the length of the roof and at each end there is a wooden mat extending from the running board down to the plate. The slats in this mat are spaced 2 in. apart, to allow for a firm footing in getting on or off the roof. At each corner of the roof over the motorman's cab window and the entrance to platforms a copper gutter is attached to prevent water dripping off the roof on the cab windows or on passengers passing from car to car.

The sides of the car are entirely open, except for the posts and three rails of ash 1 in. thick x 2½ in. high, fastened to the outside of the posts and just above the truss plank. The seats are of the Wheeler wooden slat walkover back type. One end is fastened to the truss plank and the other rests on a seat-end screwed to the floor. By placing the seats between the posts a 30 in. center aisle is obtained. The floor is of southern pine, tongued and grooved, 1¼ in. thick, laid longitudinally,





Plan of Framing and Longitudinal Section of Open Elevated Motor Car—Brooklyn Heights Railroad.



Part Floor Plan of Open Elevated Motor Car—Brooklyn Heights Railroad.

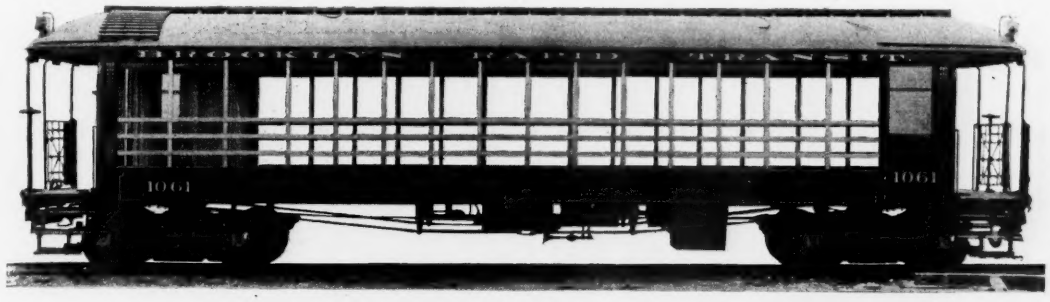
with trap doors over each truck. The space between the deafening ceiling and the floor is filled with mineral wool.

The platforms are supported on the two 5 in. I-beam center sills extending through the end sill, and by two platform sills of 4 in. channels filled with wool. A white oak buffer beam 14½ in. wide x 6 in. thick is used and 4 iron stanchions attached to it, support the platform hood. Three steps are provided at each side of the platforms. The lowest step is hinged so that it can be folded up out of the way while running. The platforms are equipped with Wood folding gates and Gold gate locks.

The inside finish of the cars is of ash in natural color and the head lining is of 3-ply quartered oak. When desired, the cars may be converted into closed cars for winter service, the side posts being cut out to allow for the insertion of partitions with windows in them. When closed in this manner the ventilation of the cars will be through transom ventilators in the header, at each end of the car, and the open work under the bonnets.

The total seating capacity is 60. Gold electric heaters will be supported under the seats, and the cars will be lighted with sixteen 16 c.p. lamps and two 16 c.p. lamps under each bonnet to illuminate the platforms. Peckham No. 40 motor trucks are used under the cars, this type having been adopted as standard on the Brooklyn elevated lines. Each axle will have a Westinghouse No. 81 motor mounted on it, controlled with the Westinghouse electro-pneumatic system. The air brake equipment will be a combination of the New York Air Brake Company's operating and foundation gear with Christensen motor driven compressors and governor. Some of the general dimensions of the car are given below:

Length over platforms	48 ft. 11 in.
Length over end sheathing	40 ft. 5 in.
Length between centers of trucks	33 ft. 6 in.
Width over sills	8 ft. 5¾ in.
Width over posts	8 ft. 5¾ in.
Width over sheathing	8 ft. 7 in.
Width over drip rails	8 ft. 9¼ in.
Height, bottom of sill to top of roof	9 ft. 2½ in.
Height, rail to bottom of sills	3 ft. 1½ in.
Height, rail to top of roof	12 ft. 4 in.
Truck, wheel-base	6 ft. 4 in.
Truck, total wheel-base	39 ft. 10 in.
Truck, diameter of wheels	33 in.



Open Elevated Motor Car—Brooklyn Heights Railroad.

The cars were designed by the railroad company, and we are indebted to Mr. K. C. Taylor, Mechanical Engineer for the company, for the drawings and description.

Car Accountants' Convention.

The International Association of Car Accountants and Car Service Officers held its 28th annual convention at the Chateau Frontenac, Quebec, Canada, June 16 and 17. The attendance was good, notwithstanding the unusually heavy car movement with which members are now burdened. Six of the founders of the Association were present—Messrs. W. E. Beecham, J. R. Cavanagh, C. P. Chesebro, C. W. Cushman, H. G. Sleight and F. M. Luce. Mr. Luce has been present at every one of the 28 annual conventions, and has held each of the official positions in the gift of the Association. The only lady car accountant, Miss A. M. Shryack, of the Peoria & Pekin Union, was present.

Convention was opened by President G. H. Waldo (C., H. & D.), and Dr. Casgrain, for the Mayor, welcomed the members. The President's address, and Secretary's and Treasurer's reports, showed satisfactory conditions. The reports of the committees, as published in our issue of June 5, page 387, were read and their authors were complimented on their good work.

The chief interest of the meeting centered on questions relating to the practical working of the new per diem system. The "Postal Junction Card" is essential to per diem accounting, and is intended to be issued promptly to advise owners of delivery of their cars to connecting roads; this occupied the first place in the discussion. Each speaker emphasized the imperative necessity for promptness and accuracy in the filling up and sending out of these cards; also that the best class of clerks should be employed on this work. A resolution passed in 1884 was reaffirmed: "That only one date of delivery shall be entered on junction cards."

An interesting discussion took place on the desirability of adopting a method, by which each foreign car would carry with it some data, so that the yard staff might be advised of the number of days such car had been upon the line; thus enabling them to co-operate in the effort to reduce the charges for per diem and penalties to a minimum. The "route card" which on many roads is tacked on when foreign cars are received at junction stations, containing date of receipt and name of delivering road, was the only method mentioned. This would doubtless have been recommended but for the fact that no adequate attention is paid to the removal of such cards when their purpose is accomplished. The education of yard men in route card removal is a crying need.

In considering proposed amendments to the per diem code, the weight of opinion appeared to be in favor of an advance from 20c. to 25c. or 30c. per car per day. On Rule 3 the majority favored the automatic application of the penalty rate on all 30-day cars. On switching reclaims (Rule 5) a large majority desired the entry of these in the switching accounts by providing a separate reclaim column on the switch blanks, to be filled up by agents; settlement to be made either between agents, or as at present, a carbon copy of the switching account to be furnished to the car accounting office; it was also considered that while a maximum switching reclaim allowance should be fixed as at present, yet it should be so arranged that when the actual per diem on any car ran below that figure, the lower number of days only should be reclaimed.

The propriety of allowing double reclaims, on cars switched with loads in both directions, also single reclaims on cars "picked up" and switched with loads, was debated; and it was ascertained that such allowances were in force at very few points, Buffalo being specially mentioned, while at Chicago and other large centers, only one reclaim per car is allowed for the round trip in the switching district, and none on "picked up cars." Many members favored the allowance of double reclaims in such cases; also a single reclaim on cars picked up in yards and loaded to connections. This was advocated as tending to more prompt handling of cars, and reduction of empty haulage. Cases were cited where switching roads were in the habit of returning empties, and immediately requesting their re-delivery, in order to earn an additional reclaim, which at Chicago amounted to $1.40 per car. The majority, however, were opposed to the extra allowance, being of opinion that no road could afford to handle empties twice for such purposes to any great extent. It was therefore decided that these matters should be left for settlement to the local associations.

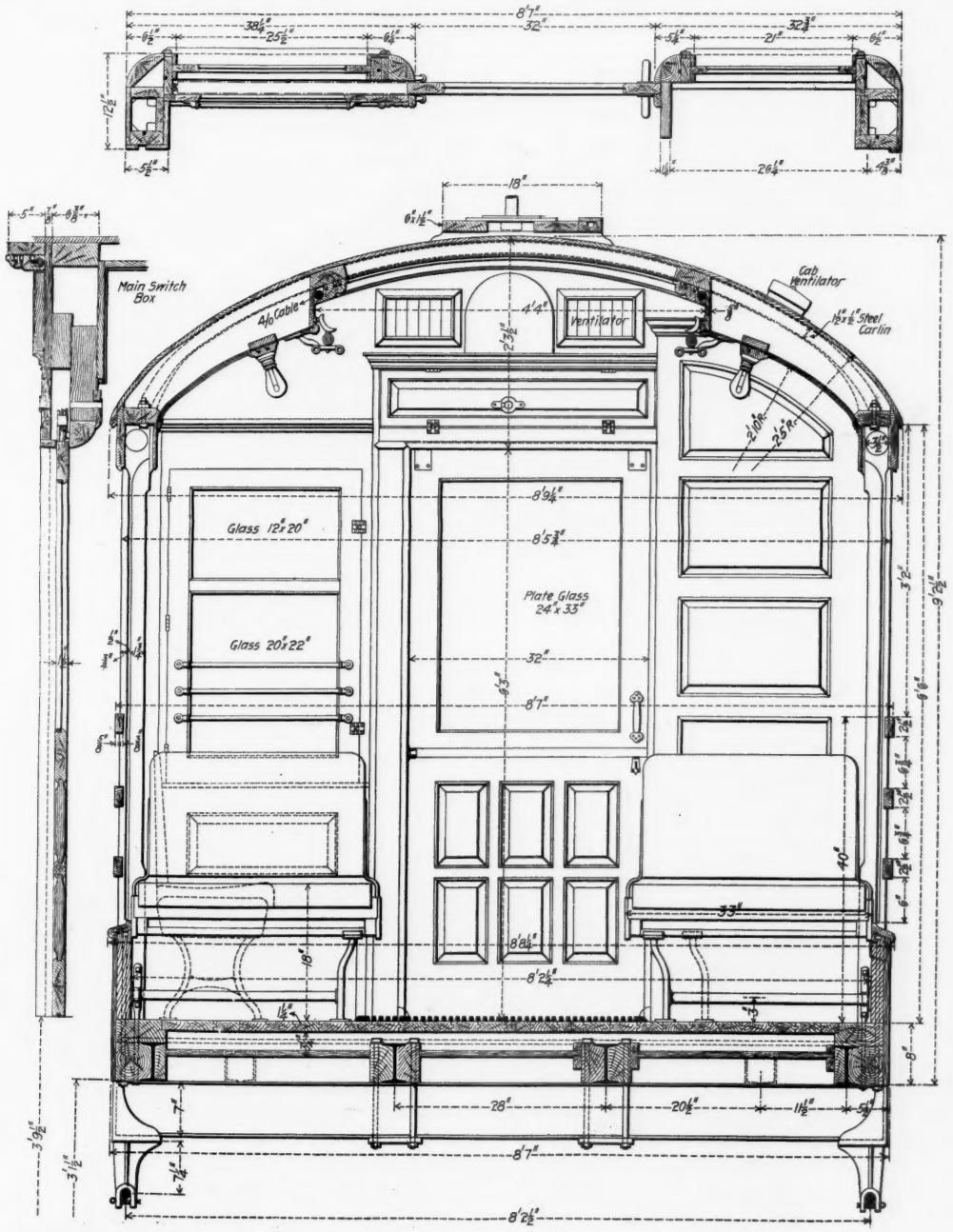
With regard to settlements under Rule 5, it was resolved, "That all reclaims agreed to prior to closing monthly per diem report shall be added thereto by the debtor road, but the per diem report shall not be delayed on account of reclaims pending." Last year's proposed amendment to Rule 7 was reaffirmed in substance as follows, "That when a car from age or owner's defects, is unfit to be loaded home, per diem should cease from date that 'Home Route' cards are asked for, until they are received."

The proposed revision of Rule 8, making per diem to recommence from date of shipment of materials requested instead of from date of receipt by the road holding the car, was not approved; as cases were cited in which such materials, sent in small lots—as they usually are—were delayed or mislaid by connections, so that one to three months elapsed between date of shipment and date of actual receipt, it was therefore resolved to recommend that no change be made in this rule.

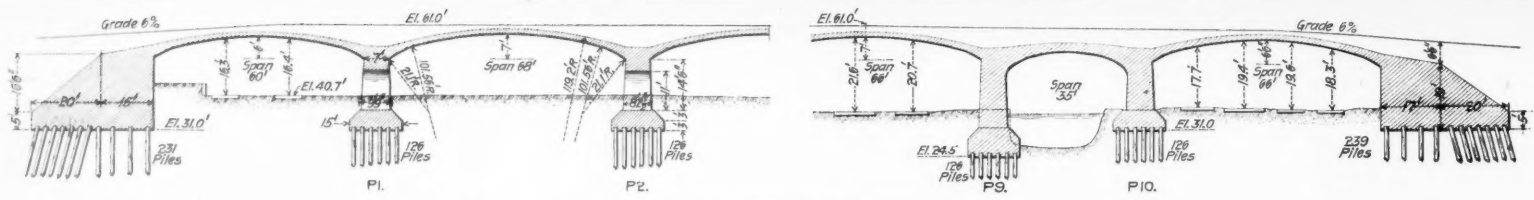
A change was proposed in the application of Rule 11, by which each road would render debit—instead of credit—accounts; but as the lack of promptness and accuracy on some roads in the issue of junction cards would make it difficult to promptly render accurate debit accounts, it was decided to continue as at present.

On the question of uniformity in size of blank forms, it was resolved that all exchange blanks used—for reporting per diem, for reclaims, penalty notices and tracers, should be 8½ in. by 11 in.; when half size forms are necessary, the headings should be in the same position as on the full size forms.

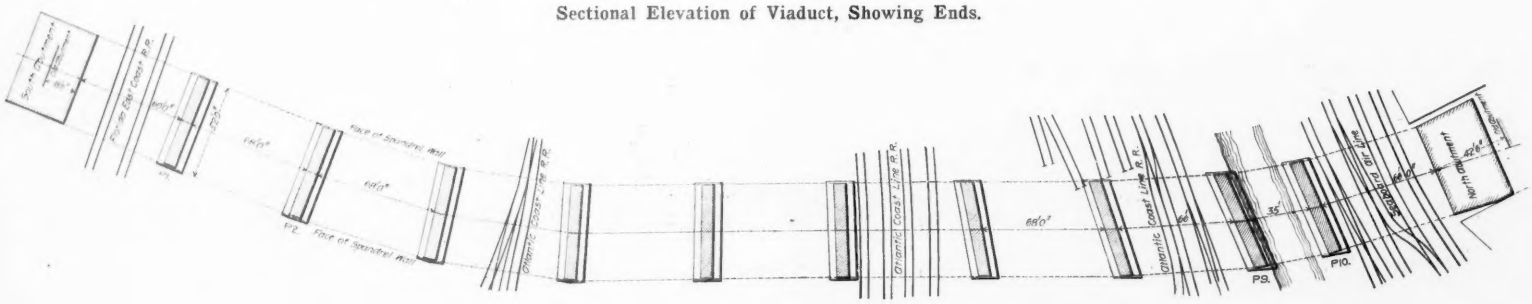
There is no adequate provision in the per diem code for the satisfactory verification of reclaim accounts, for cars held back for any road, on account of congestion, accident, or embargo, under Rules 14 and 15. This was discussed, and it was the unanimous opinion of the con-



Cross Section of Open Elevated Motor Car—Brooklyn Heights Railroad.



Sectional Elevation of Viaduct, Showing Ends.



General Plan of Piers.

vention that the amendment proposed by the committee of the A. R. A. does not go far enough; it still leaves this class of reclaims without possibility of check. It was therefore recommended, "That a road holding back cars under Rules 14 and 15, after wiring the total number of cars held, *shall* within 24 hours furnish the delinquent road with a list of the initials and numbers of such cars, and of all additional cars so held each day, during continuance of such disability."

As reclaims are being made for per diem paid on cars held for correction of waybills, either as to destination, name of consignee, customs papers, car number, etc., and as there is not at present any specific provision in the code for this class of reclaim, the convention agreed to recommend the adoption of a clause by which any road holding cars for such cause shall have the right to reclaim, on the road responsible for the incorrect billing. As it often happens that such errors cannot be discovered until after consignees have been notified by mail, etc., a certain delay should be provided for, and notice of such cars being held should be given to connection which delivered them, or to the road responsible for the errors, within at least 15 days after cars have been received.

The abnormal conditions resulting from floods, etc., at East St. Louis, Kansas City and other points, causing derailment and serious damage to foreign cars, entailing heavy additional outlay for per diem, were briefly discussed, but nothing was done.

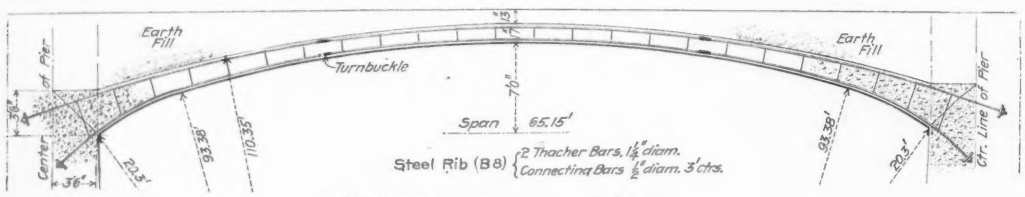
Under the head of new business Mr. Rosevear asked about the proper status of runs of engines with caboose attached, which at present are included in the definition of train mileage; he had called attention to this at the convention of 1900 (page 46 of proceedings), and still believed that such runs should not be classed as train miles, but as light engine mileage; several members upheld this view, while others opposed, and the subject was referred to the committee on office methods and accounting, for report at next convention.

The "experience meeting," for reporting new methods of office work, was as usual profitable. One of the noteworthy short cuts leading to more efficient service is the adoption by several important roads, of the "Oliver typewriter transcriber," for the quicker entry of movements of cars in the records, and which is specially useful in offices where large numbers of train reports have to be handled. The usual method is to fasten a number of train reports together, and pass them from one clerk to another, until each one has made entry of the movement of the particular cars for which he is responsible; this of course is a slow process, involving considerable delay and dissatisfaction. By the typewriter method the movements are transcribed from each train report on a coil of ribbon paper, perforated so that it may be broken up into "tags" about 1 in. square, having a ⅛ in. hole punched for filing, and each bears the initials, number and movement—loaded or empty—of one car; and as each report is transcribed, the tags are separated—sorted for each record clerk—and distributed to the desks by boys, enabling each record clerk to give uninterrupted attention to his work. It is claimed that in the car record offices of the C., M. & St. P. the Illinois Central and the Southern, where this transcribing method is in force, it has not only secured economy of labor but a much quicker completion of records. Car records which under the old method were always from one to three days in arrears, can now be easily finished at the close of each day. The C., M. & St. P. and the Illinois Central use 15 transcribers each, and the Southern eight. The clerks running them are drafted from the record staff, the new plan releasing that number from the record books. With practice, expert writers can run off 2,300 to 2,500 tags in a day. This method is an invention of Mr. Beecham, of the C., M. & St. P., who, in addition, uses the tags for a permanent record in place of books, by filing them on steel pins, which fit into holes in suitable boards placed on the office walls. On the board is displayed the number and class of each car in the road's equipment; each "pin" holds tags showing the movement and history of a car for several months. A sample outfit in operation was exhibited; and but for the initial cost of the machines, many would have liked to adopt the plan.

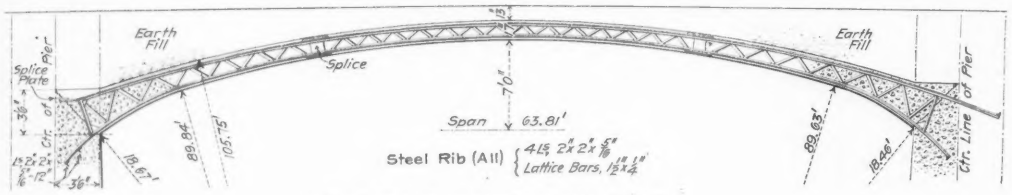
In the discussion of the report of the Committee on "Large Cars," the American Railway Association was commended for pressing upon the three Classification Committees, the adoption of their approved scale of increasing and decreasing minimums, graded to the various lengths of cars. The progressive action of the "Official" Classification Committee, in recently increasing the minimums on various classes of freight, was also commended.

The 28th convention was a decided success, a good proportion of members taking part in the discussions. The interest was well sustained throughout each of the four sessions held. Officers for the ensuing year were elected by acclamation as follows: President, W. H. Rosevear, Grand Trunk, Montreal; Vice-President, H. L. Hunter, M., St. P. & S. S. M., Minneapolis, Minn.; Secretary, L. G. Corcoran, Pennsylvania R. R., Buffalo, N. Y.; Treasurer, F. M. Luce, Chicago & N. W., Chicago, Ill. The convention will meet next year at Washington, D. C., in May.

The excursions as outlined in the announcement of the meeting, which was published in the *Railroad Gazette*, were very generally participated in and much enjoyed. Of the large number of ladies in the party many were acquainted with each other from having attended previous conventions, and the gathering at times resembled a reunion of a large and happy family. On the excursion given by the Intercolonial to Halifax, Sydney and St. John, about 120 men and women went. The sleeping cars, dining cars and other entertainments provided by the officers of the road were voted superb.



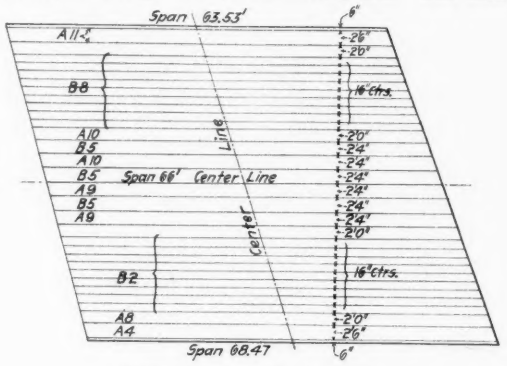
Steel Rib, Two-Bars-Connected Type.



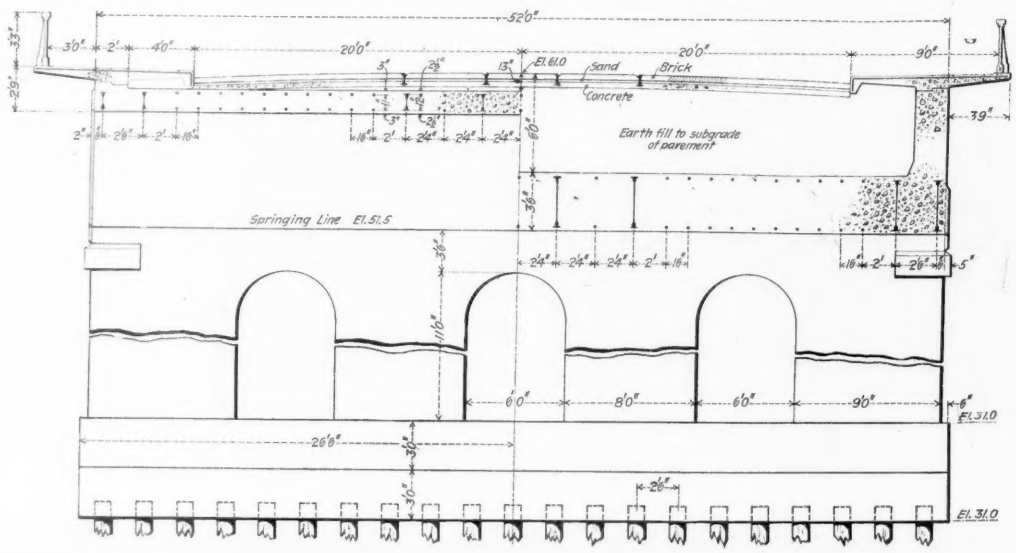
Steel Rib, Four-Angles-Latticed Type.

Concrete-Steel Viaduct at Jacksonville.

Contract has been let to the firm of Shailer & McCormick, Boston, Mass., to build a concrete-steel viaduct over the tracks of the Atlantic Coast Line, Seaboard Air Line, and Florida East Coast railroads, and McCoy's Creek, at Bridge street, Jacksonville, Fla. The total length of the structure will be 845 ft., and the width, between hand railings, will be 58 ft. The specifications call for 11 arches, the greatest span being 72 ft., with a 7-ft. rise. As shown by the plans, the characteristic arch illustrated is made of 31 light steel ribs embedded in concrete, 23 of the ribs being of the two-bar connected, and eight of the four-angle latticed type. The driveway, which contains a double line of street railroad tracks, is paved with brick, and has a maximum elevation of 61 ft. above the city datum. The piers are of concrete, built on a pile foundation; 126 piles being used for the support of each pier. The viaduct is to be built under the Melan and Thacher patents, owned by the Concrete-Steel Engineering Co., of New York, and the contract price is $149,900.



Plan of Steel Ribs in Arch.



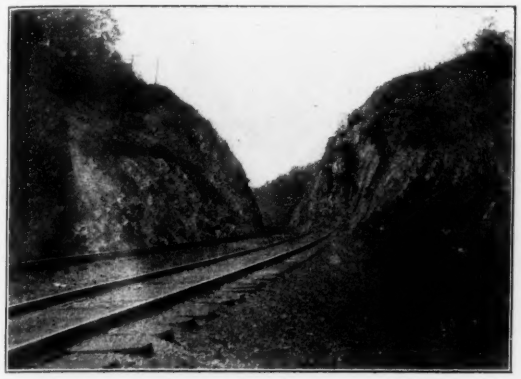
Cross Sections Through Viaduct.

The Norfolk & Western Railroad.

BY GEO. L. FOWLER.

The Physical Condition and Operation.

In the *Railroad Gazette* for June 20, 1902, there was published an account of some of the features of the Roanoke shops of the Norfolk & Western, and of the improvements, not only in course of execution but under consideration. These shop improvements, however, comprise but a very small portion of the total amount of new work which it has been decided to do for the improvement of the property. That in progress at the present time may be broadly divided into an improvement of the line and a reconstruction of some of the more important yards.



Roadbed of Norfolk & Western at Gatler's Cut, Montgomery, Va.

During the past four or five years an immense amount of work has been done to bring the road up to its present condition of efficiency, and a review of what has been accomplished will be interesting not only from an engineering standpoint but as indicative of the final results which it is desired to attain. The subject may, therefore, be divided into four heads: the present physical condition of the property and the conditions of its operation; its terminal facilities, the yards and the improvements in course of execution and under consideration along the line. As a proper review of each of these would require more space than could be given it in a single article they will be treated separately.

The main line of the Norfolk & Western extends from Norfolk, Va., to Columbus, Ohio, to which must be added at least three important branches forming portions of trunk line connections between the north and south and east and west. These are the lines from Roanoke north to Hagerstown, Md., and south to Winston-Salem, N. C.; from Radford southwest to Bristol, Tenn., and from Portsmouth, Ohio, to Cincinnati. There are also a large number of other spurs and branches of more or less consequence, all of which contribute to the traffic of the road.

Leaving Norfolk, the first 77 miles is practically an air line, there being one tangent 52 miles long; which is as fine a piece of location as can well be imagined. It was surveyed and built when General Wm. Mahone was chief engineer of the road, and had upon his staff Albert, Henry and Rudolph Fink.

The next 61 miles is through a gently undulating country with a gradual increase in the height of the fills and depth of the cuts, until at 138 miles from Norfolk the first serious cut in the sand stone is encountered. Thence on to Roanoke the country is hilly and the road crooked with some comparatively heavy grades, but nothing involving any serious engineering work.

Highway Crossing Bridge at Salem, Va.—N. & W.

From Roanoke the line has a run to the west over a moderately ascending grade for about 20 miles, after which the work is heavy over the spur of the Alleghenies which is crossed. This is evidenced by the character of the improvements under way, which are dealt with fully in another place. After emerging from the mountains and crossing to Ohio River beyond Kenova, the work is light and the grades are easy.

A single track exists for 244 miles west from Norfolk. Beyond this point there are frequent stretches of double track. In the mountain district, where the heaviest traffic prevails, there are long sections of double track which are in constant course of extension. It is expected that at the end of the present calendar year that there will be in all 125 miles of double track on the line.

Passenger Station at Salem, Va.

It has been the policy of the management to bring the track and the service up to a high degree of efficiency, and this has been accomplished. In the first place a large portion of the main line has been laid with 85 lb. rails, and the use of this section is being rapidly extended, and in the mountain districts upon curves extending out on the tangent to the commencement of the outer rail elevation these are laid upon tie plates. The curves are all of the circular arc type, little attempt having yet been made to use a parabolic approach on account of the sharpness of a great portion of the work and the increased distance required for such an approach. The rail elevation has been cut down to 7 in. as a maximum, thus making the track suitable for a speed of 40 miles an hour on 8 deg. curves, to which it is strictly limited. For ballast, furnace slag or broken stone is used over almost the whole length of the road, though there are some sections where gravel is employed. Where broken stone is used it is mostly limestone, but hard sandstone is used to considerable extent. A very large mileage of the road is ballasted with furnace slag, which is carefully selected from the various furnaces along the line of the road. This well selected furnace slag possesses the peculiar property of packing very solidly together without in any way cementing, and also without obstructing drainage in the least. The result is that the top of the ballast and the ties form a smooth, even surface that is not easily disturbed, the general appearance of which is shown in the illustration of the roadbed, taken at a point on the mountain section of the road near Montgomery, Va.

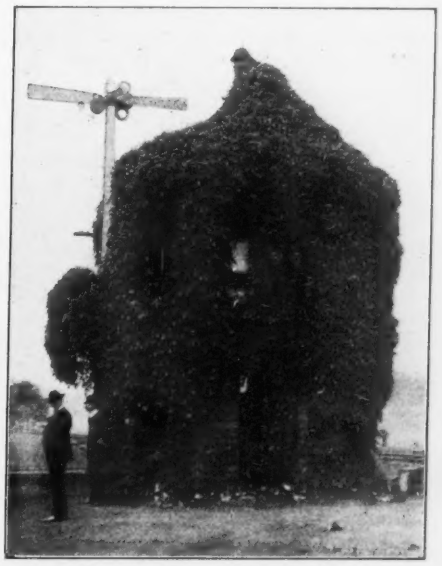
The general character of the earth used in the embankments is such that it drains with comparative ease, but where there are cuts that are disposed to be wet, they are drained with porous tile with the result that they dry very rapidly and there is no disturbance of the track due to the presence of water. All along the line the ditches are kept clean and the ballast trimmed down parallel with the rail. Two typical sections of track are shown by the accompanying illustrations, one on the peninsula section between Norfolk and Petersburg, and the other at the commencement of the mountain section at Montgomery. No attempt was made to choose particularly fine portion of the track, but the photographs were taken where it happened to be the most convenient to make the exposure, in order to give an idea of the general appearance of the roadway. From what has been said it can be readily understood that the track is firm and in first-class condition, and it would hold its own in a critical comparison with the best roads of the country, both as to appearance and alinement and surface.

Typical Section of Track on Norfolk & Western Near Petersburg, Va.

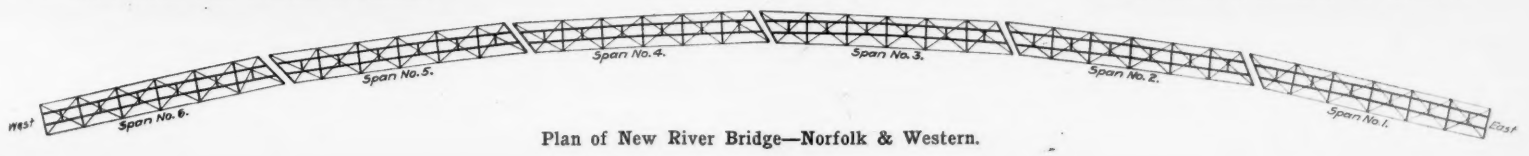
In the matter of culverts, trestles, bridges and embankments the same painstaking care has been exercised in this as in that of the superstructure just cited. The fills are well built up and the cuts are thoroughly drained. Where, in the original construction of the road, wooden trestles were put in, they have either been converted into an earth fill, or steel has been substituted. These latter are frequently of large size, as in the case of the one near Maybeury, about 328 miles west of Norfolk, which has a length of 600 ft. and a height of 90 ft. This substitution was made for the two-fold reason of obtaining a more permanent structure and avoiding the danger of tying up the road in case of fire. Sandstone is used most generally for bridge masonry, but cement and wherever it has been practicable a stone or concrete arch has been used in the place of a steel structure.

The location of the road along the banks of the Tug River renders it liable to damage by flood and the washing out of the banks. It will be remembered that about two years ago there was a serious interruption of the traffic on account of extensive washouts along the line. The means employed to prevent a recurrence of this has been to protect the banks by paving with stone. A trench about 3 ft. deep and 4 ft. wide is dug at the foot of the slope and nearly filled with heavy stone. The top of the trench and a portion of the slope is then hand paved with stone laid at right angles to the slope. This class of work has been found to afford perfect protection against the action of floods, and, indeed, it is the only one

Standard Signal Pole—Norfolk & Western.



Signal Cabin at Roanoke, Va.—N. & W.



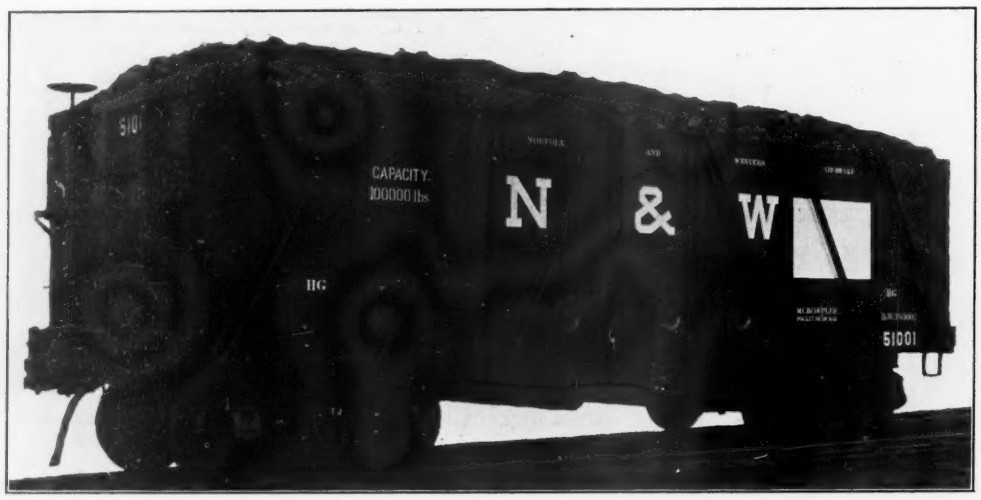
Plan of New River Bridge—Norfolk & Western.

that is efficient. At the time of the floods referred to above, banks protected in this manner were uninjured, while unprotected slopes on either side were entirely washed away.

There are only a few bridges of any magnitude upon the line. There is one over the Ohio near Kenova; a new riveted girder structure is now being substituted for a lighter pin connected through bridge over the James River near Lynchburg, and there is a fine example of this type over the New River beyond Radford. This bridge conforms to the standard adopted for bridge work, as noted below, and is of the riveted girder construction. It consists of six spans and is built on a curve, as shown in the plan.

It will be noticed that the foundations stand at an angle with the line of the bridges, and that the whole is on a curve to the left when running from east to west. The first span in this direction measures 143 ft. 8¾ in. for the north truss, and 130 ft. 3¼ in. for the south. Then follow four spans of 137 ft. each, with a sixth and last of 131 ft. 1¼ in. for the north truss and 142 ft. 10¾ in. for the south. The track enters the bridge from the river bank on the east, and immediately after leaving it, on the west, enters a tunnel through the promontory, about which the river makes a long ox bow. The bridge itself is located on the low level line that follows the New River, and was built to take place of the original one built across the hills from Radford to Dry Branch, where this new line joins the old one. As this line starts from Walton, trains to Columbus and the west are run into Radford and then hauled back, to this junction point. As soon, however, as certain improvements in the facilities for handling trains and passengers at this junction have been completed, shuttle trains will be run from Radford and the time required in doubling this three miles of track will be saved.

It may be remarked that the road has adopted the riveted through truss for all new work where the span is less than 160 ft. For longer spans, pin connected structures are used, and for short ones the plate girder is employed.



Class H G, 100,000 lbs. Capacity Hopper Bottom Gondola—N. & W.

In the matter of abolition of grade crossings considerable work has been done, but much remains. There are four bridges for carrying the streets of Roanoke over the yards at that place, and work is now in progress to take the county road beneath the tracks of the new yard now in course of construction. At several points along the line highway crossings are carried over the tracks on light wooden bridges, some of which are supported by steel columns next the rails. In a few instances, however, more elaborate structures have been erected, as in the case of the bridge at Salem, Va., shown in the accompanying illustration.

All along the line the station buildings are substantial structures, frequently of brick and in some cases, as at Salem and Bedford, they are of stone and possessed of more than ordinary architectural beauty.

A large portion of the road is worked with a manually operated, non-interlocked block system, some of which is permissive and some absolute for freight trains, but it is all absolute for passenger trains. These signals are not interlocked, but the signalman in charge is expected to get permission from the following station to clear for a train. The signals are held normally to danger and are cleared on the approach of a train and set to danger immediately after the passage of the same. There are no distant signals. The illustration of the standard signal pole with the three semaphores attached show the type of these signals that are used. It will be noticed that there are two full length semaphores and one small one extending to the left below. This short one is the permissive semaphore and governs the up-grade movement. There is none on the down grade where no permissive work is allowed and the absolute block prevails. For the passage of a passenger train both the large and the small semaphore must be dropped, indicating that the line is clear, and no train either freight or passenger will be permitted to enter that block until the next block is clear. If, however, only a freight is in the block, the upper arm may be dropped and the lower one held at danger, and under these conditions a freight train is allowed to enter the block under control.

As already indicated for the reverse movement down grade the absolute block is in force and no permissive signaling is allowed. All of the level section of the Norfolk Division is worked by absolute block wherever the system is in force, and the first permissive signal is located at Thaxton, 234 miles west of Norfolk, where the line begins the really serious work of climbing over the Blue Ridge mountains. These signals may be in connection with a station and under the control of the station master, or at intermediate points with a simple wooden building to shelter the signalman. In a few places where there is an interlocking plant a more elaborate cabin is built similar to the one illustrated, which is at the western entrance to the present Roanoke yard. In times when the traffic is light, as on Sundays, some of these signals are set to clear and the cabin abandoned, for the time, which simply amounts to an extension of the block.

The economical handling of freight trains where there are steep grades to be overcome is a serious matter on all mountain roads, and the method adopted on the Norfolk & Western is a combination of double heading and pusher service on the hills, and has been worked out

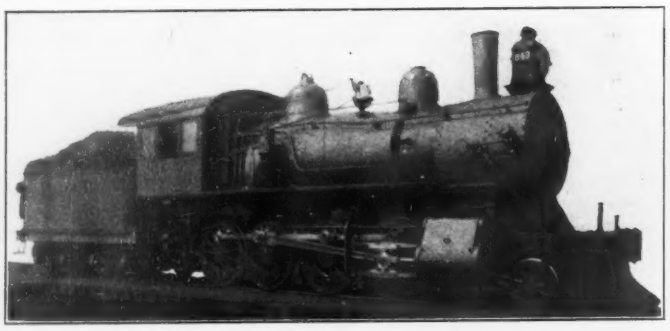
80,000 lbs. Capacity Gondola Car—N. & W.

with the greatest care by the officials in charge. The tonnage rating for the standard locomotive has been so arranged that the maximum efficiency is obtained over the whole length of the line, and pushers and double headers are resorted to wherever the ruling grades would require the load for a division or portion of the same to be divided. The coal traffic is, of course, the controlling element in the matter, and this originates at the various operations in the Pocahontas region. Bluefield may be considered, in a general way, as the assembling point of eastbound traffic, which comes in from a large number of spurs that lead off to the mine tipples and whose length varies from a few yards to several miles.

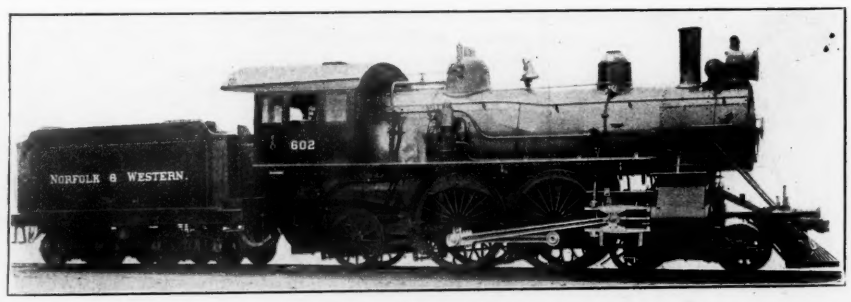
In the conduct of the traffic over the road, the standard Class W consolidation locomotives are given a rating of about 3,500 tons over the comparatively level section running into Norfolk, with allowances, of course, in the mountain districts where heavy grades are encountered and the rating must necessarily be less. Here it is made up to the engine's capacity over the average grades of the division and pushers, or double-headers, are freely used at points of especial difficulty. In this way the paying weight of the train is kept well up, averaging about 2,150 net tons each, over the whole distance of 275 miles from Pocahontas to Norfolk.

It now remains to pass in brief review the rolling stock with which the traffic of the road is carried on. Of the passenger service, little need be said. It is small in comparison with the freight, but is first-class in every particular. The locomotives used for it are usually of the 10-wheeled (4-6-0) type, which is especially adapted for work on the steep grades of the mountain sections of the road, where heavy trains are hauled. The engines are known as the Class A and have the following principal dimensions:

Weight of engine	166,300 lbs.
Weight of drivers	134,300 lbs.
Capacity of water tank	6,000 gals.
Capacity of coal space	12 tons
Diameter of cylinders	20 in.
Stroke of pistons	28 in.
Diameter of driving wheels	68 in.



Class W, Consolidation Locomotive—N. & W.



Atlantic Type Passenger Locomotive—N. & W.—Built by the Baldwin Locomotive Works.

Diameter of boiler shell	66 in.
Steam pressure	200 lbs. per sq. in.
Grate area	32.6 sq. ft.
Heating surface (total)	2,559 sq. ft.
Heating surface (tubes)	2,376 sq. ft.
Type of valve	Piston

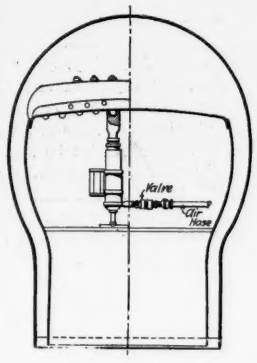
In order to provide an engine better adapted for the work of the level sections at the eastern and western ends of the road, locomotives of the Atlantic (4-4-2) type will soon be out into service, six having been ordered, and these are now ready for delivery, a description of which appeared in the *Railroad Gazette* for Feb. 6, 1903.

The freight traffic is handled by what is known as the class W locomotive. This is an engine of the consolida-

tion (2-8-0) type and was fully illustrated and described in the *Railroad Gazette* April 25, 1902. As a recapitulation of the description published at that time, the following dimensions are given:

Weight of engine	168,000 lbs.
Weight of drivers	158,000 lbs.
Capacity of water tank	5,000 gals.
Capacity of coal space	10 tons
Diameter of cylinders	21 in.
Stroke of piston	30 in.
Diameter of driving wheels	56 in.
Diameter of boiler shell	64 in.
Steam pressure	200 lbs.
Grate area	47.3 sq. ft.
Heating surface (total)	2,474 sq. ft.
Heating surface (tubes)	2,318 sq. ft.
Type of valve	Piston

The cars for the coal traffic are, of course, by far the most important. These are of three classes, if the classification be made on the basis of capacity. They are of 60,000 lbs., 85,000 lbs. and 100,000 lbs. capacity respectively. The first are the older cars and it is doubtful if they will be duplicated in any quantities when those in service are worn out. The cars of 85,000 lbs. capacity are long gondolas that were originally stenciled for a capacity of 80,000 lbs. After they had been in service for a time it was found that they had cubical capacity and strength of body sufficient for a load of 85,000 lbs. They were accordingly stenciled to this capacity for the sake of the increased revenue resulting therefrom; and, as they are equipped with the same trucks as the cars of 100,000 lbs. capacity the working has been entirely satisfactory.



Cleaning Crown Sheets.

The principal dimensions of the 85,000 lbs. capacity cars are:

Length inside	33 ft. 0 in
Height inside above rail	8 ft. 5½ in.
Width inside	9 ft. 1 in.
Length over bumpers	36 ft. 6½ in.
Length over end sills	35 ft. 1 in.

The third of the coal cars is the 100,000 lbs. capacity hopper bottom gondola whose principal dimensions are:

Length inside	30 ft. 9 in.
Width inside	9 ft. 2 in.
Length over buffers	34 ft. 6 in.
Width over side sills	9 ft. 6 in.
Length over end sills	33 ft. 0½ in.
Height above rails	10 ft. 0½ in.

Both of these cars of 85,000 lbs. and 100,000 lbs. capacity have steel underframes and steel side framing riveted to the sills; all parts being of rolled shapes. In service they have shown themselves to be remarkably stiff and durable, bulged sides being an unknown quantity.

The fourth type of freight car that forms an important factor in the freight equipment of the Norfolk & Western is the steel frame box car of 80,000 lbs. capacity, which was fully described and illustrated in the *Railroad Gazette* for April 18, 1902.

The principal dimensions of this car are:

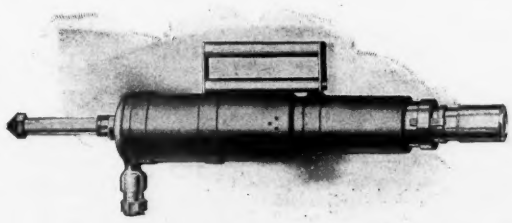
Length inside	36 ft. 0 in.
Width inside	8 ft. 6 in.
Length over end sills	38 ft. 3 in.
Width over side sills	8 ft. 7¾ in.
Height inside	7 ft. 6 in.

Of course these few samples of rolling stock must not be understood to include all that the road possesses, but they are those upon which the greater dependence is placed for the proper carrying on of the traffic. Like many of the other items in the physical condition of the property they are the results of the development that has been in progress during the past four or five years, other features of which will be brought out and emphasized by the articles to follow.

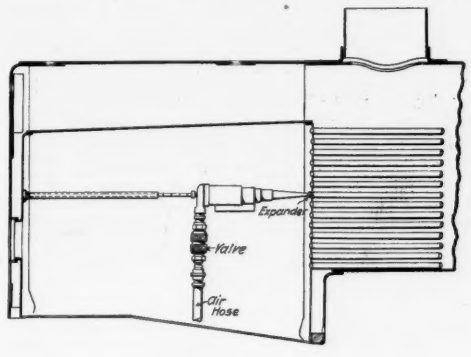
Some New Uses for Pneumatic Tools in Boiler Work.

Two new applications of pneumatic tools to locomotive boiler work are illustrated in the accompanying engravings. The tool used in each case is a No. 000 jam riveter made by the Chicago Pneumatic Tool Company. In one case the crown sheet is being cleaned by the tool, and in the other the tool is being used to expand tubes with a sectional tube expander.

To clean a crown sheet a 2-in. plank is placed across the fire-box to support the riveter, which is provided with cupped dies to fit over the head of the staybolt or rivet. The air pressure in the machine holds the die firmly against the sheet, while the riveter strikes a succession of heavy, rapid blows. This cleaning is usually done when the locomotive is in for general repairs, and when the tubes are removed. The crown-bars or radial stays do not need to be removed, and the cleaning is thoroughly and quickly done. The New York Central has been using this method of cleaning crown-sheets for some 18 months with most satisfactory results. At two of its shops prior to the introduction of this method there were being removed an average of 15 sets of crown-bars a month at an average cost of $100 a set. In 1902 it was necessary to remove only four sets of crown-bars, the reduction being attributed to the use of this method of cleaning. After a first thorough cleaning, subsequent operations require much less time.



No. 000 Jam Riveter.



Expanding Tubes.

The use of the jam riveter in the tube expanding is said to give results far superior to those of the long-stroke riveting hammers, which are frequently used, and it is easier on the workman. The riveter is suspended with a counter-weight, relieving the workman from supporting the tool, and enabling him to work more rapidly.

The Master Mechanics' Convention.

The 36th convention of the American Railway Master Mechanics' Association was held at the Grand Union Hotel, Saratoga, N. Y., June 24 to 26, inclusive. The meeting was called to order by the President, Mr. G. W. West, Superintendent Motive Power of the New York, Ontario & Western. The officers for the ensuing year are: W. H. Lewis (Norfolk & Western), President; Peter H. Peck (C. & W. I.), First Vice-President; H. F. Ball (Lake Shore & Michigan Southern), Second Vice-President; J. F. Deems (Vanderbilt Lines), Third Vice-President; Angus Sinclair (*Locomotive Engineering*), Treasurer (re-elected).

EXTRACTS FROM THE PRESIDENT'S ADDRESS.

. . . The press of the country has tried to persuade the public that the trouble (freight congestion) was with the motive power departments, or a lack of motive power or equipment; as a matter of fact, it was because nearly, if not quite all, the trunk lines lacked terminal facilities. It was no uncommon thing during the past winter to see miles and miles of trains, with the engine of the following trains within coupling distance of the leading train waiting for orders to move, and instances have been cited to me of train crews reporting for duty immediately on arrival of train at destination ready for work, having had the required amount of rest on the trip while side-tracked or awaiting orders. All these facts tend to prove that the freight congestion so much talked about was not due so much to lack of power and equipment as to operation or lack of terminal facilities.

. . . The per diem method or system of handling freight equipment demonstrated to many roads that it is wiser and better to look after the movement of cars they owned than to build additional ones. The same rule, if applied to their locomotives, would give equally surprising results.

. . . The anthracite strike enabled the bituminous coal companies to obtain a much higher price for their fuel and the result has been that the cost of fuel to operate our locomotives has been very materially increased. It is strange that notwithstanding this one item of expense on many roads equals the cost of repairs and wages of enginemen combined, it is given the least attention of anything entering into the performance sheet figures. The wide fire-box engines lose a large percentage of their savings and other advantages in the extra coal used in cleaning fires and that consumed, while held on side tracks and at terminals. Undoubtedly any road having 100 locomotives in service can well afford to employ one man to every 100 miles of road to give this question of fuel his entire attention. Like a great many other things that have been tried on railroads, the tonnage rating has in some cases been overdue, and in others only on paper. Of all the attempts at rating the capacity of our locomotives, this tonnage basis has been the most abused; in the one case engines are going over the road with much less than their rated capacity, which is disastrous to the fuel side of the sheet, and in other cases the engines of same class and condition are given much more than their rated capacity, which is just as severe on the fuel charge.

On the road with which I am connected, by putting this matter of tonnage rating in the hands of one man, one class of our engines are now hauling from 96 to 100 per cent. of their rated capacity as against an average of 80 per cent. when the system was first looked after by one man. The increased number of tons hauled by this one class of engines represents a saving of one train in five. Our Association could do no better service for the railroads than to investigate the loss in fuel burned while engines are at rest on side tracks, ash pits and terminals. Much time and money have been spent in valve gear, exhaust pipes and smoke-box front-end arrangements to reduce the quantity of coal consumed while engines are working steam, while practically nothing has ever been done to prevent the waste while engines are at rest. On a certain road making some experiments in the economy of coal consumed with one locomotive, a saving was demonstrated of 30 per cent. in fuel; 20 engines were afterward changed and the saving fell to 5 per cent. The matter was fully investigated and it was found that the one engine had been given a train that kept it in nearly constant service; 20 engines could not be kept so employed and the difference between the 5 per cent. and 30 per cent. was that consumed while at rest.

. . . From all that can be learned, our improvements, so-called, do not accomplish all that is to be desired in the way of eliminating engine failures.

. . . There seems to be a great diversity of opinion regarding the advantage or efficiency of the piston valve, and from all that can be learned the engine failures are not reduced on lines using them. In this connection have we not for the past few years paid too little attention to the one important factor in successful railroading—engine failures—little things that affect the public and are seldom talked about in our meetings?

In my opinion, it will hold true on nearly all roads that 20 per cent. of the engine failures represent 80 per cent. of the cost, while the other 80 per cent. of failures represent only about 20 per cent. of the money damage, but represent a large proportion of perplexing delays. Many of these can be attributed to poor inspection, others to defects attending the high boiler pressure, such as broken water and lubricator glasses, etc., while quite a few are due to patent sanders and broken spring hangers. Men connected with mountain roads, as I have been nearly all my life, will welcome the effort that is being made to meet the one serious defect in the automatic air-brake, viz., liability of heavy freight trains getting beyond control of the engineer descending long grades while train is being recharged. The Westinghouse people have an attachment connected with the engine that serves a valuable purpose in connection with the automatic brake, as it relieves the friction from the locomotive tire while other brakes are in service, thus allowing the tire to remain cool and tight on wheel center and better adapted to check the speed of train when brakes are applied, which is only during the time train brakes are released while auxiliaries are being recharged.

Recent tests in stopping high-speed trains have demonstrated that the braking power of any metal used for braking diminishes as the heat increases, and we have found that engines equipped with the device referred to will hold trains down to the same speed, during all the time the brakes are being recharged, that had been attained at the time necessary to recharge.

. . . Steelmakers have placed on the market several brands of high speed steel, and, in my opinion, the railroads have not in years derived so much benefit from so little expense as we have during the past year, while additional tools have been hard to get and the output of our shops has depended entirely on the capacity of tools we had, which in many cases has been increased 100 per cent. by the use of this new tool steel.

The principal locomotive works turned out 3,582 locomotives during the year 1902, or over one locomotive every working hour in the year. Of this number 1,297 were engines rated as 90 tons or over and 742 were compounds.

It has been suggested that some representative form of membership be considered, either on a basis of total number of engines owned, or tractive power of engines owned. It would seem that the interests of the various roads would be best represented in the number of engines owned rather than tractive power, it being a simple unit and one requiring no calculation.

During the past year your association has been honored by a check from Jerome Wheelock estate in the amount of $1,000, to establish a Jerome Wheelock fund. It is to be hoped that this fund will be increased so that the income from it, together with the additions from our proposed new form of membership, will enable us to conduct scientific investigations that will be a credit to the Association.

Our financial condition is not up to the standard of the Association. Our Secretary explains the increase in expenditures due to our printed proceeding being unusually large and full of cuts and tabulated matter. In other words, we are giving too much for the money we get. We cannot afford to give less and our only hope is that some means will be devised at this meeting to increase our receipts.

A year ago we had 707 members, 653 of which were active. Two former members have been reinstated, 95 new ones added. We have lost through transfer, death, resignation and non-payment of dues, 51, leaving us 699 active and a total membership of 752.

Those who have met with us in the past and have crossed the river from whence no traveler returns are: John A. Quinn, W. C. Dallas, Edward Grafstrom, C. B. Hogsett, A. Handee, Jacob Lasey, active; E. F. Moore, associate, and William Swanstrom, George H. Prescott, honorary members.

The Executive Committee reported that there is a committee now investigating the question of locomotive front-ends, in conjunction with tests now being conducted at Purdue University, Lafayette, Ind., by the *American Engineer and Railroad Journal;* also that a committee was selected to outline tests and experiments affecting locomotive performance, to be carried on by experts under the direction of committees of the Association. The cost of conducting these tests as outlined by the above committee will greatly exceed the present financial resources of the Association, and when continued from year to year or additional investigations authorized, will vary.

It has been suggested as a means of increasing the revenue of the Association to meet this additional expense, that a representative membership be created, based on the number of engines in actual operation, including engines in shops for repairs.

The committee proposed the following amendments:

Article 3, Section 1, an addition:

One representative member may be appointed by any railroad company to represent its interests in the Association. Such appointment shall be in writing and shall emanate from the president, general manager or general superintendent. Such member shall have all the privileges of an active member, including one vote on all questions, and in addition thereto shall, on all measures pertaining to the determination of what tests shall be conducted by the Association of the expenditure of money for conducting same, have one additional vote for each full 100 engines which are in actual operation or in process of purchase by the road or system which he represents. Such membership shall continue until notice is given the Association of his withdrawal or the appointment of his successor.

Article 3, Section 3, an addition:

Representative members shall pay, in addition to their personal dues as above, an amount for each additional vote to which they may be entitled, as shall be determined each year by the Executive Committee, prorated upon the cost of conducting such tests as may be determined upon at each convention, provided that no such assessment shall exceed $5 per vote per year.

The above is simply a notice of amendment, and in accordance with the constitution, will lie on the table until the next annual convention.

Mr. E. C. Fuller (Bessemer & South-Western): The Interstate Commerce Commission in March last modified the safety appliance law covering the application of grab-irons to tenders and locomotives, making the law effective September 1st next. As there is quite a difference in the tenders used on the roads, the question of the proper location of the grab-iron or hand-hold, is a matter on which we would like to have the views of the Association.

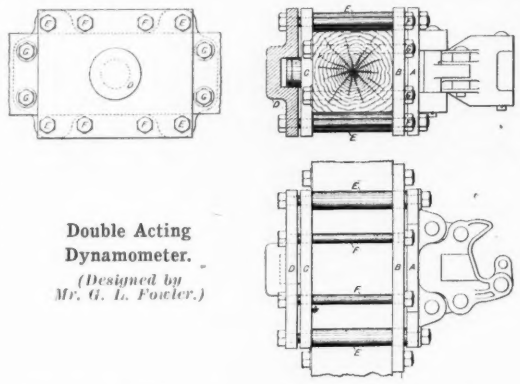
The President: This is an important matter and I think one which is not generally understood, that the law governing the application of safety appliances includes the tender and the locomotive. If there is no objection I will appoint a committee to look into this matter. It will be necessary, probably, for them to take the matter up with the Interstate Commerce Commission. I would appoint as such committee Mr. Thomas Purves, Mr. E. C. Fuller and Mr. P. H. Minshull.

TON-MILE STATISTICS.

(See Railroad Gazette, p. 469.)

Mr. C. H. Quereau (New York Central): Two of the members thought that the proper credit would be one which was in proportion to the tonnage entering the station at which switch engines were at work; but we were unable to propose any satisfactory method of arriving at it. Most of the report is from results of tests made for the *Railroad Gazette* by Mr. George L. Fowler. The present arbitrary credit of six miles an hour is almost twice too high. The first records obtained showed such a low mileage that it was decided they must be wrong, but subsequent events have proved that his first records were correct.

Mr. George L. Fowler: The heavy engines that are being used to-day are doing very much more work than the lighter ones that were in service a number of years ago. I have designed a dynamometer (Fig. 1) for measuring the work that the engine was doing. The bumper timber is shown in the upper right hand corner. There is a plate B bolted securely to it by bolts G. This plate is immovable, and is attached to the buffer. The coupler is attached rigidly to the plate A. Passing through the plate A is the bolt E, with a heavy shoulder against the plate A, and also another shoulder against the plate C, so that if A is pushed back by buffing, the plate C is carried back with it. The hydraulic cylinder is shown at D and is bolted by the bolts F to the plate B. If there is a buffing stress applied to the coupler, the plate C is pushed back and the plunger exerts a pressure in the cylinder. If there is a pulling stress, the plate A is moved away and pulls against the cylinder D by means of the bolts E; but the plate C cannot follow it and comes up against the buffer beam, and that also puts a pressure in the cylinder. I would suggest that a dynamometer be put at each end of the locomotive and a recording apparatus connected with each one, so that not only the mileage of the engine, but also the amount of work done could be obtained for every movement of the engine.



Double Acting Dynamometer.

(Designed by Mr. G. L. Fowler.)

Mr. Sinclair: A great part of the work done, so far as expense to the department is concerned, is when the engine is not pulling or pushing cars. An engine may pull for three or four minutes at its maximum, while in the next three or four minutes the engine is using as much fuel as when it was pulling the cars. It is much more equitable to the mechanical department to estimate a fair day's mileage by the hours the engine is at work.

Mr. P. H. Peck (Chicago & Western Indiana): If the committee allows three miles an hour for switching engines, the engines make not more than 12,000 miles a year, and tires would need to be turned every six or seven thousand miles.

Mr. A. L. Humphrey (C. & A.): A mileage of not less than six miles an hour for all locomotives would be a fair compromise; and for the heavy locomotives, 10 miles an hour would not be inconsistent.

Mr. Quereau (New York Central): If it costs 10 times as much to maintain a switch as a freight or passenger engine, we should know the fact and not make the cost of our repairs on switch engines average with the cost of repairs on freight engines unless it represents the facts. I would like to see a satisfactory method of arriving at a credit of ton miles for switching locomotives, but at present I do not see any practicable way of getting at it. Inasmuch as this subject is being considered by a committee of the American Railway Association, this committee should be discontinued.

Mr. F. H. Clark (C., B. & Q.): The road with which I am connected has come to the conclusion that we should eliminate the mileage basis altogether and get down to the hour basis.

Mr. S. W. Miller (P., C., C. & St. L.): If we do not know the switch engine cost, in comparison with other engines, there is no way to reduce the expense. On the basis of six, eight or ten miles an hour, the expense may be about what the road locomotives cost, but there will be no inducement for anyone to reduce the expense. We (P., C., C. & St. L.) have found that the figures given by the committee are corroborated at almost every point on the system.

Mr. George L. Fowler: The matter has been brought up of crediting the engines with six miles an hour, because the roads are using heavy engines. In the article in the *Railroad Gazette* from which this report was taken, the size of cylinders and weights on the drivers were given. The weights ran from 90,000 to 110,000 lbs., and the size of cylinders averaged about 18 in. by 26 in.

[On motion the committee was continued for another year.]

BEST TYPE OF DRAWBAR BETWEEN ENGINE AND TENDER.

(See Railroad Gazette, June 26, p. 470.)

Mr. Bartlett (B. & M.): The engine and the tender should be bound together as one unit. There should be no lost motion and I can see no better solution than the proposed wedge arrangement.

Professor Hibbard: The only reason for a spring connection between engine and tender is that on a curve the drawbar does not get cramped and broken.

Mr. J. L. Lawrence (Cumberland Valley): The spring buffer between engine and tender is an improvement over the wedge arrangement.

Mr. H. H. Vaughan (Lake Shore): By putting a spring attachment having initial tension between engine and tender, the weight of the tender steadies the engine which is advantageous. The face of the buffer should be long, thus obtaining a sliding action like that between the buffer plates on vestibules. Enough surface is thus obtained to keep the friction plate up and prevent the spring buffer from cutting into it and the angular movement is taken up by the rock of the buffer on the spring.

Mr. D. Van Alstyne (C. G. W.): It is impossible to put up a rig between engine and tender with solid wedges that will not wear rapidly. It is necessary, with spring buffers, to get a broad surface rather than a round surface, and thus reduce the bearing area.

TESTING PLANT OF THE PENNSYLVANIA AT ST. LOUIS.

The Secretary read a communication from the Pennsylvania Railroad Company, as follows:

The Pennsylvania Railroad system has arranged with the Universal Exposition of 1904, at St. Louis, to install a locomotive laboratory, to be operated during the seven months of the exposition for testing locomotives. The exhibit will be in charge of Mr. F. D. Casanave. The tests shall be upon the highest scientific basis, and the effort will be made to obtain results which will be of permanent value. It is expected that many recent designs of American and European locomotives will be tested. In order that the best results possible may be attained, it has been decided to ask your honorable body and the American Society of Mechanical Engineers each to appoint an advisory committee of three members. The Pennsylvania will provide all necessary apparatus and the force of engineers. It is our intention to ask the general commissioners of the principal European countries to appoint, each, a mechanical engineer of high standing to represent those countries on the advisory committee.

A committee was appointed consisting of Messrs. C. H. Quereau, E. M. Herr and J. E. Sague to assist in the work, and at a meeting of the committee they decided to confer at once with the Pennsylvania experts in charge of the work.

ELECTRICALLY DRIVEN SHOPS.

(See Railroad Gazette June 26, p. 466.)

Mr. R. H. Soule: The report says "we have a figure which will represent the generator capacity required without the necessity of taking into account the cranes, transfer tables, or turntables." That seems to be remarkable, that you can estimate the generator capacity without reference to cranes, transfer tables or turntables. At the proposed Lehigh Valley erecting shop at Sayre, Pa., there are two 120-ton traveling cranes, and six 15-ton cranes. Is it possible, in estimating the generator capacity of a power plant, that the eight cranes can be disregarded, and that the capacity of the generators can be estimated on the horse-power of the motors used to drive tools, and the fan load and lighting? It seems to me that is almost incredible.

Mr. L. R. Pomeroy (General Electric Co.): If cranes were calculated and allowance made for them, probably the allowance would only be 25 to 30 per cent. of the total load, and that is the way we arrived at the load for the cranes, and that is the way that the Lehigh Valley generator schedule was figured.

Concerning the variable speed (tool driving) obtained by field control, the three wire system necessitates a motor with a 100 per cent. field control. The opinion seems to be that speed control obtained by field manipulation is a make-shift. Varying the speed of a motor by means of field manipulation is commercially feasible and mechanically and electrically practicable; further, it is the handiest and simplest method of obtaining such variation. The horse-power remains constant as the field strength is a function of the speed, while the current from the line across the armature is practically a constant quantity and the horse-power will vary as the voltage. As the horse-power required to remove metal is independent of the speed, the same horse-power is required at the lower as at the higher speed, and the speed regulation should vary as the diameter of the work, to obtain the same cutting speed throughout.

Mr. H. H. Vaughan: The cost of the power plant at Collinwood is about $10,00 too low when additional items that can be charged against the power plant are considered.

The difference in output that can be got with a tool having electrical control and one having the ordinary arrangement of belts and cones is only 2 per cent.

On planers, slotters, shapers and all that class of tools, the horse-power should vary with the speed, or perhaps the square of the speed. It takes nearly three times the power to double the speed of a planer, so that on those tools the four wire system, in which the motor horse-power varies substantially as the speed, has the advantage over a constant horse-power system, in which a motor must be used large enough for the greatest power required.

Records taken at Collinwood show that the load factor is about 30 per cent.

LOCOMOTIVE FRONT-ENDS.

(See Railroad Gazette, June 26, page 467.)

Mr. H. H. Vaughan: I believe that these results given in the report establish the relation of stacks and nozzles as closely as they ever will be established for a 54-in. front-end. These results should not be taken as applying to any size front-end, simply by increasing or diminishing the diameter of the stack in proportion to the diameter of the front-end. As nearly all new engines, and practically all those that will be built in the future have front-ends of 70 in. to 80 in. in diameter; it will be necessary to carry out tests on a large front-end and to check up the relation between the two sizes.

Mr. F. H. Clark (C., B. & Q.): I made some tests in road service to confirm results obtained in the laboratory. We began with an 18 in. x 24 in. engine, 54-in. stack, and found that according to the rule recommended the choke stack minimum diameter should be 14 in.

Mr. Vaughan: It is important to note that the stack referred to by Prof. Goss has a 1 in 6 taper. If it is desired to use a stack of an intermediate taper lay out the straight stack recommended by Prof. Goss and the taper stack, one above the other, from which judge the right size of stack for the taper you wish to use.

STANDARD PIPE UNIONS.

(See Railroad Gazette June 26, page 469.)

The standard for pipe unions already considered by the committee was adopted by the Association.

LOCOMOTIVE FORGINGS AND SPECIFICATIONS FOR DRIVING AND TRUCK AXLES.

(See Railroad Gazette June 26, page 471.)

Mr. F. H. Clark (C., B. & Q.): It is proposed that the results of the committee's work are to be brought before the International Railway Congress in 1905. There is nothing novel in the specifications recommended with the exception of the manner of taking the test piece.

Mr. Kincaid (Amer. Loco. Co.): We have made some tests along this line, and can get the test in 15 or 20 minutes. Ordinarily, the horizontal boring mill is the best tool to use and the chisel is the only difficult part. If the piece can be properly nicked, a few tries with the chisel will remove the test piece and it is in good condition to be prepared for the testing machine.

As regards the specification I suggest that the manganese be increased a trifle.

Mr. H. F. Ball (Lake Shore): Did the committee consider the elimination of truck axles from this specification, confining the specifications to driving axles alone, and having the truck axles conform to the M. C. B. standard axle specifications?

Mr. Clark: In view of the many different sizes of engine truck axles, and the probability that in the case of any certain engine truck axle there would be no similar size for similar size of tender or car axles, we concluded not to attempt to recommend a drop test for the axles referred to.

Mr. Pomeroy: The International Bureau of Tests makes no distinction between engine truck axles and tender axles, but we think that there should be such a distinction, adding another clause to the specification.

THE STEAM TURBINE.

Mr. L. R. Pomeroy (Gen. Elec. Co.): . . . Dr. Thurston says: "In the steam turbine, the most important loss, which is inseparable from the reciprocating engine, is entirely eliminated; and there is apparently no reason why there should be any practical limit to initial pressure or expansion. The mechanical friction of the turbine is particularly small, and the work spent on friction is not naturally increased by increasing the range of expansion. This allows the steam to be properly expanded much further than would be useful or even practical in the ordinary reciprocating engine.

" . . . In the development of types, two broad lines have been followed. In one the purpose has been to transform, as completely as possible and in one operation, the heat energy of the steam into the mechanical energy of the escaping jet. This then impinges on the vanes of the turbine and gives up such a fraction of its kinetic energy as the conditions may determine. The De Laval turbine is a representative of this class. In the other general types, the two transformations are more or less continuous or distributed in stages throughout the machine, thus transforming the heat energy by expansion into the energy of the jet, and this into mechanical energy through action of the vanes. Then the same process is repeated until the largest possible fraction of energy has been thus transformed."

. . . The maximum amount of energy delivered by the steam jet will be when the turbine vane has about one-half the velocity of the jet, for in that case the remaining velocity in the jet after impact will equal the velocity of the vane, and therefore be incapable of imparting further energy. Speaking broadly, in order that a single-wheel steam turbine may act at maximum efficiency, its vanes should have a velocity of about 2,000 ft. per second, working between the foregoing limits of pressure, that is, not far from the velocity of a projectile from a modern piece of ordnance. On account of the lower velocity of the jet of a water turbine it is possible to approach the speed of revolution corresponding with the theoretical maximum economy. The elasticity of steam, however, as contracted with the non-elastic condition of water, compels the compounding of the steam turbine, as the compounding of the water turbine would destroy its efficiency, while the momentum of the steam, though checked by the first series of buckets, recovers itself instantly by expansion, and is checked again and again by successive series of buckets, until the steam has expended its expansive force. The problem encountered in the steam turbine is to extract from the steam the work due to its velocity without exceeding a moderate rate of revolution of the shaft carrying the vanes upon which the steam expands its velocity.

In the Curtis turbine the reduction of speed is obtained, first, by placing the vanes upon which the steam impinges at a relatively great radial distance from the axis of revolution, since for a given speed of peripheral velocity the revolutions will be inversely as the radius; second, by a gradual absorption of the velocity of the steam at the periphery of a number of vane wheels, and instead of having all of these wheels in one chamber, they are divided into two or more groups of three or more wheels, contained in separate chambers, but secured to the same shaft. This provides for the development and partial absorption of velocity in stages, the work being equally divided among the several stages. The De Laval turbine depends almost entirely on an initial velocity due to complete expansion of the steam in the nozzle, while with the Parsons, being of the parallel flow type, the energy imparted to the vanes is that due to the expanding steam through the wheel.

. . . In steam consumption several of the present commercial forms of steam turbines show economic performances somewhat less than those of the most efficient reciprocating steam engine, such as is designed for pumping service, though apparently fully equal to the best types of reciprocating engine used in electrical generation and superior to the ordinary engines employed in that service. A specific advantage is that there is very much less falling off in economy at fractional loads as compared with the best type of reciprocating engine, which, it is perhaps unnecessary to add, is a point of the highest importance in electrical generation. Moreover, there are the undisputed commercial advantages of considerable less cost of turbo-generator unit and less floor space occupied. The possibility of using a very high degree of superheat with the turbine still further extends its possible economic advantages over the reciprocating steam engine. An interesting fact concerning the development of the steam turbine is that large and small turbines are nearly equally efficient.

The steam turbine lends itself directly to solutions of problems involving the necessity of concentrating the largest amount of power in the smallest possible area consistent with economic operation.

Some of the advantages are: (1.) High steam economy. (2.) Extreme mechanical simplicity. (3.) Extremely small floor space. (4.) Perfect symmetry of form. (5.) Uniformity of expansion with no alignment difficulties. (6.) Ideal form and speed of generator. (7.) Accessibility of all parts.

Professor Hibbard: There appears to be great possibilities for the gas turbine. A gentleman connected with one of our western universities has just made a thorough investigation of the gas turbine, with the result that the General Electric Company has employed him to investigate and improve the gas turbine.

INTERNAL COMBUSTION ENGINE IN RAILROAD SERVICE.

(See Railroad Gazette, June 26, p. 453.)

Mr. R. H. Soule: Mr. Sanderson says that ordinary engines cannot be operated on a coal consumption of less than 5 lbs. per horse-power per hour. According to the technical papers the stationary engines in the power plant at Collinwood are horizontal cross-compound and non-condensing. They are guaranteed to use not over 19½ lbs. of steam per horse-power per hour. If we assume for the boilers an evaporation of 8 lbs. of water to 1 lb. of coal, and if we assume an efficiency of 90 per cent. for the engine in transmitting power from its cylinder to its shaft, and again assume 90 per cent. efficiency in the electric generator, we have a combined efficiency of 81 per cent. for the engine and generator considered as a unit. Applying the figures reached by these assumptions it is at once shown that power is delivered at the switchboard on a consumption of 3 lbs. of coal per horse-power per hour. Whenever the relative economy of gas engines and steam engines is being considered the first and most important thing to be ascertained is the exact calorific power of the fuel gas which is to be used. This may vary in a ratio of 10 to 1.

THE METRIC SYSTEM.

Mr. Angus Sinclair (*Locomotive Engineering*) gave a short paper opposing the metric system.

Mr. J. Player (American Locomotive Company): The decimal system is bound to come; it is a matter of destiny. An amendment should be added to the resolution to the effect that while we do not approve at the present time of adopting the metric system as a whole, we do advocate some decimal system of weights and measures. I have had shop experience with both systems, and the metric system went into use very gracefully.

Mr. Quereau: This resolution is not opposed to the metric system. It is as to whether it should be made compulsory or not. The resolutions are urged against the bill and not against the system.

The resolutions were adopted.

LOCOMOTIVE HEADLIGHTS*.

Fully 37,450 of the 41,300 locomotives in the United States still retain the oil lamp and ordinary planished reflector for headlights. About 3,200 have electric headlights, using the ordinary reflector, and generating electricity with small steam motors of the reciprocating or turbine type. There are some 1,650 acetylene generators now in use for generating gas for locomotive headlights, which are mostly equipped with the regulation sheet iron case and planished reflector; the remainder with what is known as the "lens mirror" or "searchlight reflector," which is much smaller than the planished reflector and vastly more powerful and reliable, occupying a much smaller casing, which is usually formed cylindrically, and therefore much more compact and durable. The reflector itself being of glass and practically indestructible, requires only occasional wiping off to be in condition for service indefinitely.

Acetylene gas, while costing more for its carbide than oil, does not require chimneys nor expensive burners with wicks, and gives out several times the candle-power of the best type of oil-burning headlight.

The electric headlight is more expensive in the line of first cost; also in maintenance, owing to a motor and dynamo being required to generate the current, and the amount of steam needed to operate it. The intensity of the light thrown out is objected to by some.

A road reports the comparative cost of operating oil and acetylene lights as follows:

The relative cost of the different types of headlights might be approximated at $25 for the oil lamp, $100 for acetylene and $200 for the electric. Careful records will show that but little, if any, economy, will follow the use of the oil lamp, while the efficiency is largely in favor of electricity or acetylene.

*Extracts from a paper by Mr. Wm. McIntosh, Superintendent Motive Power of the C. R. R. of N. J.

REPORT OF SPECIAL COMMITTEE ON GRAB IRONS.

The committee appointed to consider the application of grab irons or handholds to the front end of locomotives and rear end of locomotive tenders beg to call the attention of the Association that the safety appliance act, as amended March 2, 1903, and taking effect Sept. 1, 1903, is made to apply to all trains, locomotive tenders, cars and similar vehicles used on any railroads. The committee respectfully recommends that the rear of locomotive tenders be equipped with grab irons to conform to the M. C. B. standard of equipping flat cars. The law makes it necessary that pilot couplers be made operative without the necessity of trainmen going between the locomotive and car. This makes it necessary to devise some method of operating the pilot couplers from the outside. The report is signed by Messrs. T. B. Purves, Jr., C. E. Fuller, P. H. Minshull.

EFFECTS OF TONNAGE RATING ON THE COST OF CONDUCTING TRANSPORTATION.

(See Railroad Gazette, June 26, p. 472.)

Mr. D. Van Alstyne (C. G. W.): I do not favor the proposition to decrease expenses and increase the tonnage handled by decreasing the rating of the engines on the general line of a railroad. The train load is governed by one or two ruling grades; and the economy lies in getting the tonnage up to what the engine can drag over these grades, and on the balance of the road there is no difficulty. It is true that it is easier for a despatcher to handle trains if he knows he can count on the trains making their meeting points, by not having too large a tonnage; but, on the other hand, there are a great many side tracks that are badly placed for getting in and out, and I think you would lose about as much as you would gain, by reducing tonnage and increasing the number of trains. In addition to that, it has been my experience that any reduction in engine rating, which increases the number of times an engine has to go into the side-track and roundhouse, is vital to a good coal record, which is one of the principal expenses. The amount of coal consumed in side tracks and at terminals very largely governs the coal record.

Mr. W. McIntosh (C. R. R. of N. J.): There is no economy in loading locomotives beyond their economical point. In some cases there is considerable loss in that way. The longer the train the more difficult it is to make the sidings; and nearly all roads are using old cars with weak draft gear, and when these cars are put in a train with modern cars, there are sure to be many failures—and failures will increase according to the weight and length of the train.

Mr. John Player (American Locomotive Company): The rating should be reduced to the maximum economical basis instead of the maximum theoretical basis. The maximum theoretical basis over-strains the engine, which in turn causes leaky flues.

Mr. Quereau: In all cases the maximum tonnage rating is in excess of the most economical rating.

TESTS AND EXPERIMENTS TO DETERMINE LOCOMOTIVE PERFORMANCE.*

The following subjects for investigation were suggested by the committee:

Boilers.

1. Best type of boiler for heavy passenger and freight locomotives, with a special view to eliminating staybolts, radial or sling stays and braces, and with a sufficient area of heating surface to supply cylinders when engine is worked to its maximum capacity; fuel to be used, bituminous coal (run of the mine) and fuel oil. Also to determine the safe water level over fire-box when the locomotive is worked to its full capacity at maximum steam pressure on a grade of from 2 to 3 per cent.
2. Quality of the steam furnished cylinders during the maximum demand at full boiler pressure.

The specific object of this test is to determine to what extent the locomotive boiler of modern design has accomplished in the way of providing a steam space of sufficient capacity to furnish dry steam under all conditions.

3. Amount of heating surface per horse-power.
4. Maximum horse-power which can be maintained continuously in simple and compound engines for a given heating and grate surface.
5. Relation between boiler pressure, initial cylinder pressure, mean effective pressure and piston speed.
6. Coal tests to determine best proportion of grate surface for various grades of fuel, principally with a view to determining the best dimensions of wide fire-box grates.
7. Proper depth of fire-box under the tubes.
8. Proper tube spacing, considering the circulation, durability of tube sheet and steaming capacity.
9. Difficulties with long boiler tubes.
10. Economical length of boiler tubes in connection with area of tube.
11. Causes of leaky flues.
12. Circulation in locomotive boilers of different types.
13. Influence of scale on the evaporative efficiency.
14. Best point to introduce feed water.
15. Practicability of heating feed water.
16. Economy and advisability of piping exhaust from the air pump into tank.
17. Superheated steam.

*Extracts from a report to the Master Mechanics' Convention by Messrs F. M. Whyte, G. M. Basford, E. D. Browner.

18. Applicability of water tube boilers to locomotives.

Tractive Force, Adhesion, Valves and Valve Gear; Cylinder Clearance; Back Pressure.

19. Variation in tractive power in starting and at different speeds and the effect upon slipping.

20. Advisability of changing the Master Mechanics' Association coefficient of adhesion for passenger, freight and switching locomotives.

21. Train resistance at high speeds.

22. Locomotive resistance at high speeds as influenced by cross-section of the locomotive.

23. Valve dynamometer tests to determine the friction of piston and slide valves.

24. Design of the piston valve.

25. Proper clearance volume for simple engines and for two and four cylinder compounds, high and low pressure cylinders.

26. Effect of steam chest air valves and by-pass valve.

27. Effect of the inertia of the reciprocating parts of the valve gear.

28. Indicator tests to show the relation of size of exhaust nozzle to back pressure at various speeds.

Fuel, Etc.

29. Preventing smoke.

30. Economical train speeds from the standpoint of fuel economy.

31. Fuel economy of compounding.

32. Pulverized fuel for locomotives.

33. Better methods of using oil in locomotives.

34. Stokers for locomotives.

35. Openings in ashpan and their relation to grate and fuel area.

36. Best relation of stack to grate and heating surface.

Materials for Various Parts.

37. Best formula for iron used in locomotive castings; best form of piston heads and packing rings.

38. Best design and kind of metal for driving axles for heavy passenger and freight locomotives.

39. Best design of driving box bearing. Also best composition for driving box bearings and crankpin bearings.

40. Proper pressures for journals, engine truck, driving and tender for various conditions and surface velocities.

41. Best form and material for connecting rods.

REVISION OF STANDARDS, RECOMMENDATIONS AND RESOLUTIONS.

(See Railroad Gazette, June 26, p. 469.)

The report of the committee was adopted.

PISTON VALVES.

(See Railroad Gazette, June 26, p. 467.)

Mr. Angus Sinclair: The piston valve seems to be like the compound locomotive—a splendid thing, but something must be done to make it perfect. The piston valve does well when starting out in good condition, but when it has been used a short time it becomes defective.

Mr. D. Van Alstyne (C. G. W.): If we could have obtained a slide valve which would give satisfactory service with the size and pressure required on heavy engines, we might have been for some reasons better off with the slide valve, but we know we have not had any such slide valve and have had more trouble with slide valves on heavy engines than we have had with piston valves. On the other hand, I am inclined to think that piston valves begin to leak and blow pretty soon after going into service.

Mr. John Player (American Locomotive Company): Relief valves with piston valves are a necessity on cylinder heads, especially at high speeds. In some places they screw them down instead of adjusting them at proper pressure, and consequently they do not work. By-pass valves combined with piston valves are a benefit, especially upon engines that have to do drifting. Circulation pipes have the same function as the by-pass valve, but they have a tendency to freeze up. The results accomplished by the circulation pipe can be accomplished by a good construction of by-pass valve.

Any properly proportioned L-shaped ring is the ring to use as it gives a proper cut-off edge.

The cylinder clearance of large engines with slide valves is abnormal, in many cases. The clearance obtainable with piston valve cylinders varies from 6 to 8 per cent. in a simple engine. I do not know of any piston valve engine of recent design where the clearance exceeds 9 per cent.

Lubrication of piston valves is an easy matter. In some forms the oil is applied at both ends of the valve, instead of in the center.

With regard to the trouble in handling piston valves, in dropping down in the corner, and the racking of the valve motion, proper instructions should be issued to engineers for handling piston valve engines. The lever should not be dropped down while the engine is speeding, but dropped down gradually as the speed decreases. The object of this is obvious. The piston valve runs in a bushing, and not over a plain surface like the slide valve. The lubrication for the bushing and valve is taken in the middle, and the lubricated surface is that over which the packing ring travels. The surface covered by the exhaust steam, which is not covered by the travel of the valve when working, becomes dry and encrusted to a certain extent with scum. With the lever in full gear it has to be cut off at one stroke, or else it snaps in the packing rings and they travel over it.

Mr. McIntosh (C. R. R. of N. J.): My experience in operating and caring for slide valve engines is that they give trouble by leaking joints. It is also difficult to maintain the steam chest tight. Some of our high-speed engines have broken the connecting parts, but in nearly every instance it was due to poor metal.

Mr. David Brown: The annular space back of the edge of the port is not the same all the way around on a piston valve. On the top it is contracted, and there is little space from the edge of the bushing to the top of the annular space. Consequently, any steam that goes in there has got to be forced through the bridge on each side and still further on it is contracted, so that there is not the full benefit of the port realized. The piston valve does not give a chance to fasten the cylinders to the frame, as can be done with the slide valve. One gentleman remarked about dropping the lever. I do not think an engineer will drop it more than once. If he does, he learns by experience that not only the lever goes down, but he goes out of the window.

RECENT IMPROVEMENTS IN BOILER DESIGN.

(See Railroad Gazette, June 26, page 469.)

Mr. D. Van Alstyne (C. G. W.): The modern high-pressure boiler, with the wide grate, can be made to do all that is expected of it in every respect except as regards flues. Wide water spaces around the fire-box, especially at the crown-sheet, long staybolts, easy curves at doors and mud rings and scarfed corners in general have to a great extent done away with cracked sheets and broken staybolts and troubles from fire-box leaking. The wide-grate engine is 10 per cent. more economical than the ordinary narrow grate of 40 or 42 in. with the same heating surface. But the wide grate is more wasteful of coal when standing on side-tracks and at terminals, and apparently the increase is about proportional to the increase in grate area. Modern high pressure engines steam freely as a rule, and there is very little complaint from foaming or priming but flue trouble is general. It is not altogether a question of bad water; it is not due to the length of the tubes, nor is it a question of the method of setting. It is not due to lack of care; it is not a question of spacing the flues, although there seems to be quite a general opinion that that has done some good. So far as the committee's knowledge goes the wider flue space does not cure the trouble.

The joint of a flue in a sheet will not stand a very high temperature without leaking. An experiment I made consisted in rolling some three sections of tubes in a piece of ½-in. boiler plate, in various ways—with copper ferrules, without bead, and without ferrules, of various gages—and heating them rapidly and cooling them in water, and it took a long time to make any of them give way. It is not altogether a parallel case with the boiler. On all the boilers with which I have had experience the tubes below the center line give trouble and are the least overheated. The prime cause of the trouble is circumferential contraction and expansion of the tubes at the sheet, and the remedy is to make the flue and the sheet expand and contract together. The advantage of the depth of fire-box is due to the fact that it provides a reservoir for cold water, keeping it away from the bottom flues. Leaky flues probably have a greater influence on locomotive performance than any other factor.

Mr. O. H. Reynolds (Amer. Loco. Co.): There are engines running to-day with over 300 tubes, where the space is not more than ⅝ in., the result being poor circulation. For clearance between tubes and boiler shell we allow 4½ in. on 72-in. boilers. But we have boilers of that diameter where the flues approach a great deal closer to the sheet, and the effect on the circulation is evident. Herr Von Borries has placed the limit of rate of evaporation at 14.5 lbs. of water per sq. ft. of heating surface per hour, and the limit of rate of combustion at 97 lbs. of coal per sq. ft. of grate surface per hour. We can get no such evaporation at that low rate of combustion. The association should take steps to demonstrate the effect of a reduction of the number of tubes by increasing the pitch.

Professor W. F. M. Goss: As I understand the committee tests, fusible metals were placed in the tubes between plugs of asbestos, tightly driven. It was assumed fair to suppose that no heat would reach these particles of fusible metal, except through the water of the boiler, and it was found that the temperature within the tube increased 70 deg. beyond the temperature of the steam in the boiler, from which it is concluded that the temperature of the water around the tube was at least 70 deg. greater than the temperature of the steam in the boiler. I do not think that can be so. The only thing which could allow such an increase in the temperature of the water around the tube would be a corresponding increase in pressure at that point. Viewing the subject purely as a physical proposition, it seems unfair to accept the results that have been quoted as indicating the actual condition within the boiler. It cannot be that the water around the tube has a temperature anywhere near 70 deg. above the temperature of the steam in the boiler.

Mr. D. Van Alstyne: I understand Professor Goss would assume that in our experiments some fire got around the plugs and melted the metal, but I doubt that, as it melted pretty near to the front end of an 18-ft. tube. There is evidence that side-sheets get red hot. We have found them very badly burned. When a piece of side-sheet, cracked in service, is broken, examination of the fire side through a microscope shows it burned. I do not see why such high temperatures could not be transmitted through the narrow space between the tubes and melt the metal.

Professor Goss: I discredited the experiments only in so far as they are assumed to show that the water in the boiler had a temperature of 70 deg. higher than the steam in the boiler. The water, as water, could not have a temperature 70 deg. higher than the steam in the boiler.

Prof. H. Wade Hibbard (Cornell University): We made some tests on the effect of increasing temperatures upon the life of staybolts to see whether the increasing steam pressures up to 300 lbs. per sq. in. would cause them to become more brittle, because of their being at the blue temperature, as we supposed. At temperatures corresponding to atmospheric pressure, then with a jump up to 160 lbs., and then varying by small amounts up to 300 lbs., the staybolts became more ductile, just the reverse of what we expected.

Mr. C. C. Fuller (Erie): We have experienced trouble on Wooten boilers from the throat-sheets checking and cracking and bulging in toward the fire. In one case on an Atlantic-type engine that ran less than nine months, the throat-sheet was distorted inwardly about ¾ in. The flue-sheet had forced the flange of the throat-sheet down about ½ in., so that the throat-sheet was bent in and out. We concluded that the water was driven away from that point of the sheet by the heat. We tried the experiment of putting a shield in the boiler, about 18 in. long, running up between the two central bottom flues, and down against the boiler shell, to prevent slushing of water on the throat sheet. The engine went through the shop about three months ago, and the sheet was still good.

Mr. John Player: The whole trouble with the present locomotive boiler resolves itself into one of circulation.

TOPICAL DISCUSSIONS.

Long Locomotive Flues.

Mr. H. F. Ball (Lake Shore): Where the conditions are the same the long flues do not give more trouble than the shorter ones. The difference in the service of two lengths of flues is due to the difference in the fire-boxes, because the engines with wide fire-boxes give us more trouble as far as the flues are concerned.

Mr. A. L. Humphrey (C. & A.): We have not had any more trouble from the 20 ft. flues, 2¼ in. in diameter of our new "Pacific" type engines with wide fire-boxes, 108 in. x 72¼ in., than with the 2 in. flue, 13 ft. 6 in. long. It is a question of water and not the length of tube. As the length of the fire-box is increased, it will be necessary to increase the length or gage of the tubes and the width of the bridge. We use ⅞ in. bridges $^{9}/_{16}$ in. tube sheets and 11 gage for the 20 ft. tubes.

Mr. Fowler: An elaborate series of experiments was made on the Paris, Lyons & Mediterranean with tubes of various lengths, and it was found there was no advantage from an evaporative standpoint in increasing the length of tube beyond 14 ft. That does not apply to American locomotive practice, because the rate of combustion was only 40 or 50 lbs. of coal per sq. ft. of grate area per hour.

Mr. C. A. Seley (C., R. I. & P.): My idea is that long tubes are made necessary by the wheel arrangements.

Mr. Humphrey. The distance from the front flue sheet to the exhaust nozzle is 6 ft. in our "Pacific" type locomotives, as we were afraid to experiment with longer tubes.

Mr. David Brown (D., L. & W.): Is the engine a free steamer?

Mr. Humphrey: Yes, they are the best steamers, and the most economical on the ton-mile basis we have.

Professor Goss: If the length of the tube can be increased, there will be an advantage in the performance of the boiler, provided the number is not reduced. Difficulties experienced with long tubes are those of maintenance, keeping them tight, and perhaps the disadvantage of reduced draft. We know the smoke-box temperatures of locomotives are sufficiently high to give us service from the gases if we can adapt our mechanical arrangements to a utilization of the heat.

What is the most satisfactory way of setting flues in the fire-box tube sheet, and what is the best style and form of tool for setting and repairing them?

Mr. P. H. Minshull (N. Y., O. & W.): The holes in flue sheet should be as nearly perfect as possible and a properly annealed copper ferrule inserted and rolled, the boiler then being ready for the flues. The ends of the tubes should be swaged and afterward annealed; grind off all scale from that part of the flue which will enter the flue sheet; drive the tube through the sheet the proper distance, and expand it with a tapering pin. They should then be rolled with an expander and beaded with a pneumatic hammer, after which they are lightly rolled.

Mr. Miller (P., C., C. & St. L.): I am somewhat of an iconoclast on the present method of setting flues. Not only is it unnecessary to use the roller expander in setting flues, but its use is a detriment to the life of the flues and flue sheet. I use nothing but the Prosser expander. The use of the roller expander distorts the holes in the flue sheet, while the Prosser expander does not.

Mr. David Brown: With new flue sheets it is not necessary to use the expander at all. If you get a new flue sheet, swage the flues down, with a 2-in. flue, making the hole 1 $^{15}/_{16}$ in., and get a copper liner, probably No. 10, and roll it a little. The flue is then swaged down to fit in snugly, and then rolled and beaded. The roller we use has the rollers on an angle, not parallel with the spindle, which facilitates getting out better, feeding in, etc.

Prof. H. Wade Hibbard (Cornell Univ.): On some recent large boilers, the tubes nearest the outer shell are not more than 2½ in. from the boiler shell, whereas they ought to be 4½, 5, or 5½ in. The tube-sheet may thus be allowed to act as a diaphragm, so that as the tube expands and contracts, the tube sheet can bend. Also keep the top line of staybolts for the back fire-box sheet a lit-

tle down from the crown sheet and a little away from the side sheets, so as to give some diaphragm action back there.

Mr. George L. Fowler: Making the tube sheet so that it could come and go with the expansion of the tubes was tried in Europe a number of years ago, and found to be a failure. A corrugated tube sheet was used so that the expansion of the tubes could be taken up.

Mr. Humphrey: I believe the diaphragm suggestion is one we must pay attention to, and one which will solve the flue trouble. In some districts we have no trouble with leaking flues. In other districts if locomotives run 30 days without giving up a train, we think they are doing well. It is peculiar that the workmen should select locomotives on one division on which to perform bad work.

Mr. Henry Bartlett (B. & M.): We have done away with the Prosser expander. We require the enginemen to close the damper when on sidings or ash-pits. We have tried a flue called the spiral corrugated tube, and a set has been in service three or four years. They do not leak and are economical in coal, and reduce smoke.

Mr. Angus Sinclair: (*Locomotive Engineering*): The use of a drift is a pernicious practice. Another destructive tool is the tube roller, which is the cause of more leakage than anything else except blowing cold air through the flues when the fire has been drawn.

Grinding as a method of finishing piston rods and crank pins.

Mr. H. H. Vaughan (Lake Shore): The most important question is the relative time of finishing work on the grinding machine as against running over one or more fine cuts in the lathe and finishing by filing. The saving on grinding, as against lathe work, is between four and six to one, according to the job. The grinding machine must be exceedingly heavy to withstand the removal of metal at a high rate, which makes it an expensive machine, and any shop not doing manufacturing work would not be warranted in using the grinder.

"Range of Weights of Principal Parts of Locomotives (which are too heavy to be lifted by hand) for Use in Determining the Capacities of Cranes and Hoists."

Mr. R. H. Soule: I have obtained from both the Baldwin Locomotive Works and the American Locomotive Company complete detailed statements of the weights of the parts of four locomotives. I have picked out from the lists 62 parts, and selected the heaviest weight reported for each individual part and listed that. The heaviest complete boiler recorded is the Santa Fe tandem-compound decapod made by the American Locomotive Company, which weighs 66,313 lbs. A general boiler shop crane to handle all kinds of boilers should not be of less than 35 tons capacity. The heaviest wooden cab reported weighs 1,520 lbs., and the heaviest steel cab weighs 2,690 lbs. A full set of frames on the engine referred to weighs 21,200 lbs. A pair of cylinders bolted together complete for the Santa Fe decapod engine will weigh 27,420 lbs. The driving axle weighs 1,875 lbs., and the main pair of driving wheels on axles with eccentrics and straps weighs 9,855 lbs. The heaviest engine truck complete, Atlantic type, weighs 10,250 lbs. A tender tank reported by the Baldwin Works weighs 13,680 lbs. The tender truck complete weighs 9,060 lbs., and the tender without coal or water, 48,900 lbs.

"New Tool Steel and Its Effect on Shop Practice."

Mr. Dickerson (Lake Shore): We made experiments at the Collinwood shops with different kinds of high speed steel. We found that a coarse feed will remove more metal in a given time than a fine feed, even where the power of the machine limits the depth of cut possible with a coarse feed. Also that a much higher speed for a given cut may be obtained with a fine feed than with a coarse feed, but the increase in speed does not compensate for the decrease in cross-section of the cut.

Mr. T. H. Symington: We discovered that if we would heat the steel very hot, just enough so that you can burn it, we would obtain better results than otherwise.

Mr. J. F. Deems (Vanderbilt Lines): Some time ago I was interested in the use of high-grade steels, and an expert was employed in handling the steel and tempering it. The steel was heated to such a high degree that when the air-blast struck it, it would flow, and unless the man did that he did not consider he would get a good tool.

Mr. C. H. Quereau (N. Y. C.): In our repair shop we could increase the output of our machines, on which high-speed steel was used, about 50 per cent. I am inclined to think the percentage is low rather than high. The greatest improvement was in turning our tires. On cast-iron there was little advantage.

Mr. Vaughan (Lake Shore): The introduction of high-speed steel is the most important thing that has occurred in machine tool practice for a number of years, but its importance is not entirely due to the fact that it enables cuts to be taken at a high speed, but to the fact that it has waked up everybody. This steel will force us to investigate the machines.

A heavy feed should be taken, but the depth is more important than the rate of feed, than the amount of the feed. I believe there is room for improvement in seeing if the old steel in our shops can be utilized to get the work out. If a piece of work takes say 20 minutes for the removal of metal, and the total time is 1½ or two hours, including a number of miscellaneous movements, it is not going to pay to spend much money to cut the total time down to 15 minutes. We still have the hour and a half on the miscellaneous operation. It will pay to spend more money to get up jigs to cut down the miscellaneous time than it does to spend money for a special tool which only reduces the time by a small percentage, and this tool steel proposition will lead us more and more to the main question.

Mr. C. F. Street (Wellman-Seaver-Morgan Co.): In our shop we are using the high-speed steel on cast-steel and cast-iron in our heavy planers, and are able to take about the same cut on low-carbon cast-steel as on cast-iron.

Mr. Deems: I took up the question of twist drills three or four years ago, with the idea of using high-speed steel, and all the representatives of that kind of steel said it was not satisfactory in a twist drill.

Mr. Forsyth (*Railway Age*): In the Yarrow's works in England high-speed drills are used, made by Firth, and the steel is called "speedycut." They have made some careful experiments with the drills and find they can do the work, the improvement in the work there being about 3 to 1.

Mr. D. J. Redding (P. & L. E.): In ordinary service we get 3 to 1 in the use of high-speed steels. We can turn 44 in. tires with high-speed steel on an average of 14 pairs in 10 hours, chucking and boring complete. In one instance we bored 8 tires without changing the roughing tool. On turning tires we think that the speed limit is governed largely by the condition of the machine.

Mr. Miller: The question of advantage is entirely a relative one. Have we in the past been getting the best results from the steels we have been using, or are the advantages the result of proper application of the high-speed steel? In our shops we increased the output a little under 100 per cent., with the same steel, same men, same chucks, same material, simply by watching.

Additional Exhibits at Saratoga.

In our issue of June 26, a list was given of exhibits on the ground at the Saratoga convention up to Wednesday morning, June 24. Since that time the following have been placed:

The Adams & Westlake Co., Chicago.—The booth of this company was built last year for the Master Mechanics' and Master Car Builders' convention, and afterwards taken down and removed to Chicago until this year. The illuminated dome was added this year and is lit by acetylene.

American Balance Valve Company, Jersey Shore, Pa.—American balanced slide valves, American balanced piston valves, the J. T. Wilson high pressure balanced valve, the American Metallic piston rod and valve stem packing, the Nixon safety staybolt sleeve.

Hermann Boker & Co., New York.—"Novo" steel and cutters.

Buffalo Brake Beam Company, Buffalo, N. Y.—The Vanderbilt brake-beam.

Camel Company, Chicago.—Small models of car doors, samples of journal bearings and hose clamps.

A. M. Castle & Co., Chicago.—Full section of the Cour depressed corrugated locomotive fire-box.

Cling-Surface Mfg. Co., Buffalo, N. Y.—Model showing action of belts with and without "Cling-Surface."

Coffin-Megeath Supply Co., Franklin, Pa.—Full size model of automatic driver journal box lubricator. Also sample of the McLaughlin flexible conduit used in heating cars and testing brakes at terminal stations and yards. Also Worthington automatic coupler.

Commonwealth Steel Co., St. Louis, Mo.—Small models of Commonwealth trucks and separable bolsters.

Consolidated Railway Electric Lighting & Equipment Co., New York.—"Axle" lighted Pullman car, "Elysian" on D. & H. tracks. Car used by President Roosevelt.

The Crane Company, Chicago.—The new Crane locomotive muffler pop safety valve, gun metal globe and angle valves and blow-off valves for high steam pressure.

Damascus Brake Beam Co., St. Louis, Mo.—Samples of Damascus brake-beams.

Dayton Malleable Iron Co., Dayton, Ohio.—Dayton draft gear, Dayton patent car door fastener, lubricating center plate.

Frank S. De Ronde, New York.—Insulating paper for refrigerator cars and varnish remover.

Detroit Lubricator Co., Detroit, Mich.—Exhibit of lubricators in a room in the Grand Union Hotel.

Paul Dickinson, Chicago.—Sample of the "Dickinson Giant" cast-iron smoke-jack, for roundhouses.

Excelsior Car Roof Co., St. Louis, Mo.—Sectional models of Excelsior inside and outside metal roofs.

Fairbanks, Morse & Co., Chicago.—Photographs of coaling stations; blueprints of tanks and standpipes.

J. C. Fortiner, Chicago.—Samples of the Transue & Williams Co. drop-forge steel center-plate, drop-forge steel driver brake-shoe, drop-forge steel valve motion link and journal bearing wedges.

Gisholt Machine Co., Madison, Wis.—Groups of photographs in large frames showing Gisholt turret lathes; also heavy boring mills and tool grinders with individual motor drives.

Greene, Tweed & Co., New York.—Palmetto air pump packing and Favorite reversible ratchet wrenches.

Greenlee Brothers, Chicago.—Machine bits and hollow chisels; photographs of woodworking machinery.

H. G. Hammett, Troy, N. Y.—Richardson and Allen-Richardson balanced slide valves, oil cups, "Sansom" bell ringer, link grinders and Prendergast metallic packing.

The Harrison Dust Guard Co., Toledo, Ohio.—Samples of the Harrison dust guard in the four following sizes: 40,000, 60,000, 80,000, 100,000 lbs. capacity.

The Harrison-Williams Co., Toledo, Ohio.—Samples of the Williams car journal lubricator. Car journal box showing application; also wooden model of journal showing how waste is held against same.

Heath & Milligan Manufacturing Co., Chicago.—Samples of railroad coach and car colors.

Hoke Car Door & Fastener Co., Chambersburg, Pa.—Full-size models of the Hoke flush car door.

Howe Mfg. Co., Scranton, Pa.—A small model of the Howe sand dryer and also photographs of drying plants built by the company.

Huff Locomotive Appliances Company, Boston, Mass.—The Huff fuel economizers and smoke consumer, Huff track sanding device, variable exhaust, and automatic steam blower.

Jerome & Elliott, Chicago.—Samples of the Jerome metallic packing and McIntosh blow-off cock.

The Johnson Wrecking Frog Co., Cleveland, Ohio.—Samples of wrecking frogs.

Keystone Drop Forge Works, Philadelphia, Pa.—Keystone connecting links, safety shackle-hooks, the "Keystone Crocodile" wrench, and special drop forgings.

Kindl Car Truck Co., Chicago.—Small models of the Kindl car truck, the Cloud pedestal truck and pedestal lateral motion. Samples of roller side bearings.

The Lawrenceville Bronze Co., Pittsburg, Pa.—Samples of driving box, side box brasses, journal bearing and bushing and a large bronze likeness of ex-President McKinley.

The Link-Belt Machinery Co., Chicago.—Photographs of locomotive coaling stations and Renold silent chain driving fan for motor.

Lodge & Shipley, Cincinnati, Ohio.—Showing a 24-in. swing, 10-ft. bed, motor driven engine lathe.

McCord & Co., Chicago and New York.—Showing the McCord journal box, McCord spring dampener, McKim gasket and Torrey anti-friction metal.

McConway & Torley Co., Pittsburg, Pa.—Steel and malleable iron Kelso and Janney couplers for freight cars and tenders.

A. Major, New York.—The Major water filter, a new double boiler and regulator for perforated flush pipe.

Merritt & Co., Philadelphia.—Combination sheet steel ventilated, dustproof and expanded metal lockers.

Modern Tool Co., Erie, Pa.—Samples of the "Magic" chuck, "Modern" tapping attachment, adjustable solid die, hollow milling tool and Wallace chaser grinder.

Moffett Railway Bearing Co., New York.—Moffett pressed steel car No. 99, fitted with Moffett roller bearings, journal and parts at the exhibit of American Steel Foundries Co.

More-Jones Brass & Metal Co., St. Louis, Mo.—Arctic car brasses, Tiger bronze engine brasses, Hoo-Hoo and Rex babbitt metals.

National Car Coupler Company, Chicago.—Model of the National steel platform and buffer for passenger cars. Samples of the National freight car coupler, Hinson draft-gear and the Hinson draw-bar attachment.

The National Car Protection Co., Colorado Springs, Colo.—Small model of car door with full size car lock and seal.

National Malleable Castings Co., Cleveland, O.—The Tower coupler, the National journal box, National car door fastener.

Pearson Jack Co., Boston, Mass.—Pearson car replacing jacks, King bolt clamp, ratchet pulling jacks, ratchet journal jack.

The Peckham Mfg. Co., New York.—High speed motor truck and steel truck for steam railroads.

E. L. Post & Co., New York.—"Zero" babbitt metal for journal bearings.

The Railway Materials Co., Chicago.—Ferguson oil furnaces and locomotive fire kindler.

Rogers Metal Works, Kansas City, Mo.—Rogers special car bearing and babbitt metal.

Rogers Railway Supply Company (M. M. Rogers Co., mfrs.), Chicago.—Rogers improved journal packing, receptacles and dust guards.

St. Louis Railway Equipment Co., St. Louis, Mo.—Grain door and box car ventilators.

Scarritt Furniture Co., St. Louis, Mo.—Samples of car chairs and seats.

Schmidt Superheating Co., London, England.—Showing drawings of a superheater for locomotives.

Schoen Steel Wheel Co., Pittsburg, Pa.—Solid rolled and forged steel car wheel.

C. S. Seitz, Tiffin, Ohio.—Model of metallic railroad tie.

The Smart Car Door Co., Nashua, N. H.—Small model of the Smart flush car door.

South Baltimore Steel Car & Foundry Co., Baltimore, Md.—Four styles of Farlow draft gear.

Spiral Journal Bearing Co., St. Louis, Mo.—Samples of spiral journal bearings.

Standard Paint Co., New York.—Refrigerator car models, showing insulation, sheeting and insulating paper, iron and wood preservative paint, car flooring and Ruberoid roofing.

Sterlingworth Railway Supply Co., Philadelphia.—Rolled steel freight and tender trucks, rolled and cast steel bolsters, and O. & C. draft gear on steel and wooden cars.

R. R. Street & Co., Chicago.—Two sizes of the "Clover" portable crank-pin turning machine driven by air motors and turning pins.

Templeton, Kenly & Co., Ltd., Chicago.—Sample Simplex jacks.

H. B. Underwood & Co., Philadelphia, Pa.—Catalogue of special tools, boring bars and valve seat facers.

United States Curtain Supply Co., New York.—Curtains for cars, steam yachts and automobiles.

Washburn Coupler Co., Minneapolis, Minn.—Freight couplers, flexible head passenger couplers and switch engine couplers.

J. H. Watters, Augusta, Ga.—Showing the Watters improved A B C pneumatic track-sanding device.

The Wellman-Seaver-Morgan Co., Cleveland, Ohio.—The Wellman-Street 100,000-lb. capacity steel hopper car, the Wellman-Street cast-steel bolster, the Street tandem draft-gear, the Street twin draft-gear, and the Street journal box.

Wendell & MacDuffie, New York.—Railroad weather strips and A. B. C. jacks.

Western Railway Equipment Co., St. Louis, Mo.—Combination lug and follower casting, Economy slack adjuster, tandem combination lug and follower, sill and carline pocket, bell ringer, Western flush door, interchangeable door, safety and security truck and casting, the Mudd sander, the Lindstrom non-freezing suction pipe, Acme pipe clamps, Downing card holder, and sailing draft beam, side-bearings.

The Westinghouse Air Brake Co., Pittsburg, Pa.—The American Brake Co., St. Louis, Mo.; Westinghouse Automatic Air and Steam Coupler Co., St. Louis, Mo.; Westinghouse Electric & Mfg. Co., Pittsburg, Pa. Two quarter size four-wheel car models fitted with Westinghouse air brake; Westinghouse friction draft gear, Westinghouse automatic air and steam coupler, American automatic slack adjuster, Westinghouse high speed reducing valve.

C. H. Whall & Co., Boston, Mass.—Metallic window casings, car ventilator and samples of fibre.

Wheel Truing Brake Shoe Co., Detroit, Mich.—Samples of wheel-truing brake-shoes.

W. W. Worthington & Co., New York.—Perry-Brown combination coupler and draft rigging, Brown journal box and Ruth flue machine.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

490 Atrocious Trade Union Crimes.

By actual count, from newspaper reports, since last October, trade union members and sympathizers have been guilty of as many as four hundred and ninety atrocious crimes. They are chargeable with four murders, three hundred and fifty assaults upon the person, nine cases of shooting, and three times have the assaulted been robbed. The record of the assaults upon the home show two cases of arson, eighteen of dynamite, four of shooting and eighteen of stoning. Twenty-eight times have depredations been committed upon trains and cars; four times have railroad tracks been crippled, and there have been three attacks upon engines. Troops have been assailed thirteen times, the police resisted nine times, and there have been boycotts and internecine quarrels innumerable. Neither aged men nor women approaching confinement; neither young girls nor children, have been spared from infuriate attack when a member of the family has sought to obtain work, simply as an American citizen, although he did not hold a union card.

The student of history often notes how little the people living at the time of extraordinary events have seemed aware of their significance, and this is none the less the occasion for remark when those events have been startling lapses from advance in civilization. During the excitement caused by the murder of missionaries in China three years ago it was pointed out that the massacres of Chinese in America had exceeded the slaughter of Americans in China. A generation ago the Northern States were roused with indignant emotion because of the status of the black man in the South, which did not permit him to work for whom and when and where he chose; but in the last three years there has been no mounting clamor because of the riot, arson, wanton assault and murder which members of trade unions have used to prevent non-unionists from working for whom and when and where they choose. The Southern negro lived under the law as it then existed, but the trade unionist defies both law and humanity.

But little more than six generations ago the people of a Massachusetts village allowed innocent men and women, particularly aged and benevolent women, to be hanged because of a mad delusion which the saner minds could not control. Although the witchcraft episode at Salem Village makes a sulphurous page in American history, is it not possible that the student of six generations hence will pronounce the demoniac outrages that have been committed in these last two years and are still being committed on behalf of trade unionism to be yet more deeply saturated with the brimstone stench? Since the last of the witches was hung at Salem Village there has been a boasted advance in enlightenment, in ethical culture, in the arts of peace; yet in the highways of our great cities, sometimes literally under the very eyes of the police, men have been beaten, knocked down and kicked and gashed while down, simply because they want to work. The trade unions not only do not aid in bringing to justice those who commit these offenses against non-unionists, but by declaring strikes here and there upon impulse and without warning or preparation, reduce to destitution their own members, whom they do not always support and who in recorded cases have been driven to suicide. This chronicle is not of the past, but of the present, and its infamous roll lengthens every day.

At Salem Village during the three years of the witchcraft madness, there were nineteen executions all told. If they have left so black a mark upon the Puritan record, how broad and how deep will be the bar sinister that the judgment of history will place upon the record of the America of to-day?

At Salem Village the reign of terror came to an end because the reaction of strained nerves led to the perception of the wickedness which the community had countenanced. That the parallel is to hold good here and now we wait a sign.

The Car Accountants and Per Diem.

The car accountants, at their annual convention at Quebec, discussed per diem most of the time; and as was natural for men who have had to do the hard work of putting a crude scheme in operation, they talked mostly about faults. It was useful and praiseworthy fault-finding, however. The committee reports, given in our issue of June 5, dealt with the following principal topics:

1.—Twenty cents is too low a price.
2.—Rule 3 should be automatic.
3.—Diversion is a great and growing evil.
4.—Rule 5 and other clauses affecting switching should be modified.

And the discussions only confirmed the committees' views. While it is well for the men who manage the cars to thus freely tell their experiences, and so enlighten their superiors, it is to be remembered that the question of increasing the per diem rate is not just now a practical one. No action is likely to be taken by the railroads for a long time, and when they do act, the ruling consideration may be something quite outside the questions now being considered.

Nobody denies that twenty cents is too low a price; but many seem to forget that the necessity of having one rate for all kinds of cars and for seasons both of heavy and of light traffic, is an essential condition of success. This necessity is an evil, but it is one that cannot be avoided. Our country is so large and the conditions of freight traffic are so changeable; this changeableness is so incurable and agreement among all the railroads is so difficult, that a compromise, even if it be an unsatisfactory compromise, must be accepted by every one, or we shall not get along at all.

But look at the encouraging results of the abandonment of the mileage plan. Everybody admitted beforehand that it was a greater use of the cars, rather than an increase of rental receipts, that was to be desired. One trunk line officer who finds that he now has ten per cent. more of his own cars on his own road, says that his purpose is accomplished; he now has all the cars that his engines can handle. Even the New England roads appear to find the 20-cent rate more satisfactory than building new cars. An officer of one of them has made a statement to that effect. The New Haven people have told the public a good deal about their increased expenses of a million dollars a year for hired cars, but it is fair to assume that those hired cars are earning money for the road. When a New England road pays 20 cents a day for a car it is not giving the car-owner more than his due.

An officer of one Western road says that he is making "lots of money" by the new plan, but he did not say whether this is because his particular road has a surplus of cars to lend, or has earning opportunities for borrowed cars. In the same transaction 20 cents cannot be both too low and too high; the apparent contradiction in statements only illustrates the diversity of conditions that must exist in such a complicated business. Probably these diversities need to be studied, under the new conditions, more than one year before increasing the rate. We shall never get beyond the necessity for arbitrary rules which often produce injustice. The average rental per car per day now is about eight cents above the average received by certain roads in preceding years. Everybody can have the consolation to be derived from this, though an average never affords very substantial comfort. In the new conditions, as in the old, any real improvement in income from cars is to be got, not by Association action, but by better service at home and more courageous or intelligent dealing with connections.

A car-record officer naturally becomes indignant at every evidence of unauthorized diversion of cars. He is constantly in touch with facts showing, as the Committee says, that very virtuous railroads do a great deal of this cheating. "Cheating" is a severe word; but when loaned cars are needed; and when foreign roads persistently hold them, all the time acknowledging the facts and admitting their duty, yet not doing it, what milder word will answer?

One operating officer says that when a car is diverted the fact is evidence that the car is needed for important service; while the fact that the owner is not following it up by telegrams or by special agents is evidence that he does not need it; or at least that his need is not so imperative as that of the road that is using the car. As long as cars are lent it will be necessary to treat the borrower as in some sense a partner in its use; and even a defective partner must be trusted. We have at least stopped the holding of large numbers of cars away from home empty. Experience seems to indicate that there is no sure way to check diversion except by following up each car with persistent telegrams or visits. If it is not worth while to do that, the owner must conclude that his own need is not desperate. If it is desperate he will, of course, do the needful energetic tracing. The fact that tracing must deal with individual cars indicates that where a penalty is the only effective remedy, it must take the form of a specific charge for each car. And if the Association cannot fix a price, why not fix one yourself?

The car-accountants' committee recommends that the penalty of 80 cents a day after the first month, now required by Rule 3 to be paid on demand, be made to begin to accrue on the prescribed day without a demand from the owner. This is an attractive idea; but it seems likely that the Association did well to lay it aside for the present. We have yet to see whether a higher penalty or one based on a sliding scale will not promise better results. It is plain that even a high penalty will not bring a car home when the road holding it can make five or ten dollars a day by keeping it; and the remedy to be striven for is one that will meet this difficulty. The whole interchange business is a mass of unequal dealings which a uniform rule can fit only imperfectly.

The theories of the per diem system are now generally understood, and the ascertained facts are being digested so that everybody will soon know pretty well what he wants. It will also be clearer what, among the things wanted, it will be impossible to get. In the meantime, instead of arguing for 30 cents a day with a man who already knows that he ought to pay that sum; or about the evils of diversion with people who are fully informed about the evils but who also are fully determined to practice them, let the agitation for "publicity" be kept up. In dealings with one another about cars, as in dealing with the public about rates or legislation, the healthiest methods for railroads to use are those which let in plenty of daylight. The superintendent whose cars are persistently diverted should not only hound the diverter, but should cry his grievance in the market place occasionally. If particular roads, by reason of their favorable situation and their relief from terminal work, are making money too fast at the 20-cent rate, somebody ought to be cunning enough to get at a lot of concrete examples and show how the thing is done; show how and where the low rate works injustice; and let the facts be published.

Government Accident Statistics.

The number of passengers and employees killed on the railroads of the United States in the year ending June 30, 1902, was 3,314, and the number injured was 57,207, as appears from the annual report of the Statistician of the Interstate Commerce Commission, of which we gave an abstract June 19. As these totals are much larger than those which appeared in Accident Bulletin No. 4 the student of the statistics should bear in mind the difference in the bases of the two tables. Under the law of 1901 the Interstate Commerce Commission requires, for the records which are published in its bulletins, casualties to such employees only as are on duty, and on duty on or near the railroad. Accidents in shops or on boats or other places "remote" from the railroad are excluded. On the other hand the annual reports made by the railroad companies, in which the statistics are gathered under the same regulations that have been in force for the last 15 years, include casualties to all employees. It must be assumed, therefore, that, for example, the difference of 453 shown in the table below, under the item "employees killed," represents cases of employees at work in shops, etc.; and perhaps men in yards or on trains, but not on duty. The discrepancy in the statistics of passengers is not so easily explained. In Bulletin No. 6, issued about two months

ago, the Commission remarks that possibly the railroads during the first few months of the fiscal year 1901-1902 did not include all of the accidents which are required by the law. Some roads were found to have omitted accidents in connection with trains engaged in traffic wholly intrastate, claiming that a Federal law could not rightfully require reports of such accidents. Whether or not this claim of the railroads has been wholly demolished by the Commission, may be seen when the next annual bulletin comes out. As it is much easier to make an annual report of accidents—the whole filling a single page—than to send detailed accounts, month by month, of each of the several scores or hundreds of train accidents and personal casualties occurring in 12 months, there is room for the suspicion that some roads have neglected to comply with the monthly-report law; while they have continued, as before, to comply with the requirements of the annual-report regulation.

Casualties to Passengers and Employees; Year Ending June 30, 1902.

	Accident Bulletin Bulletin No. 4.	Statistician's annual report.
Passengers killed	303	345
Passengers injured	6,089	6,683
Employees killed	2,516	2,969
Employees injured	33,711	50,524

The number of deaths and injuries in coupling and uncoupling cars is also of particular interest, as the prevention of this class of accidents has been made the subject of a specific Federal statute. In this feature there should be little room for discrepancy between the records of the accident bulletins and those of the statistician's annual report; but there is a difference of considerable size, as appears below.

Casualties in Coupling Accidents; Year Ending June 30, 1902

	Accident Bulletin Bulletin No. 4.	Statistician's annual report.
Trainmen killed	120	141
Trainmen injured	1,816	2,475
Switch tenders, etc., killed	18	17
Switch tenders injured	230	285
Other employees killed	5	9
Other employees injured	67	104
Total killed	143	167
Total injured	2,113	2,864

It is true, of course, that coupling accidents occur now and then in shops and in the yards connected with shops; and also in the movement of cars in other places, which, according to the somewhat elastic wording of the Commission's rule, a railroad company might class as "remote" from the railroad. Even on the most all-inclusive basis the number killed, 167, shows a decided decrease from the preceding year, which indicates the continued improvement due to the use of M. C. B. automatic couplers. The only thing to be said about the discrepancies between the two records is that one of the reports ought to be abolished. The Commission said as much in its annual report; but it appears that action by Congress will be necessary to provide the desired change in the regulations.

Petitions have been filed with the Interstate Commerce Commission by the Boston & Maine and the Denver & Rio Grande for additional time within which to comply with the provisions of the Safety Appliance Act of 1893, as amended March 2, 1903. The Boston & Maine asks for additional time to equip its passenger cars and locomotives with automatic couplers, and the Denver & Rio Grande for additional time to equip its locomotives with power brakes for driving-wheels. The Commission will have a hearing on these petitions at Washington August 5. The wonder is that other railroads have not asked for like extensions; for the amendments to the brake and coupler law which go into effect on September 1 are severe. According to the first section of the new law, a car with a Master Car Builders' coupler and one with a Miller must, if brought together, couple automatically; that is to say, a link, or a chain in such a place will be unlawful. . . . A standard coupler head will have to be put on the Miller car. An engine moving backward and drawing cars, cannot legally be attached to the cars by a link or chain or bar; neither by a solid casting made in the shape of a Janney coupler with its knuckle closed; the engine must have an automatic coupler. A train (cars and engine) fitted with Miller couplers must avoid connection with M. C. B.-coupled trains as it would the bubonic plague. To run a passenger tram like those on the New York, New Haven & Hartford, mentioned at the last meeting of the American Railway Association (non-automatic couplers uniform with the cars of the Manhattan Elevated) will be unlawful. All the prohibitions and requirements of the safety appliance law apply, not merely to interstate traffic, but to all cars and engines on a road which does any interstate business. On the great majority of railroads the coupler and grab-iron clauses of the law will be comparatively easy to obey. The power-brake requirements are that, practically, half the cars in every train shall be air-braked. Superintendents whose air-brake equipment and brake-inspection facilities are so inadequate that they feel compelled, in the interest of safety, to run freight trains down their steep grades under control of the hand brake only, now have an immediate problem. As the Commission must give a notice and public hearing before excusing any road from obeying the law on September 1, applications for postponement need to be filed early.

Master Car Builders' Reports.

SUBJECTS.

For Investigation and Report at the Convention of 1904.

1. The influence of four-wheel trucks on the failure of cast-iron wheels under freight cars. To make tests to show just what effect the length of the wheel base has on the lateral pressure of the flange of wheels under cars when pulling heavy loads. It is suggested that the committee consist of Mr. R. P. C. Sanderson, Chairman; C. M. Mileham and J. J. Hennessey.

2. Stake pockets. Owing to the variety of sizes used on cars, it is thought it would be a distinct advantage, in making repairs to foreign cars, were a uniform design adopted. It is suggested that the committee consist of Mr. A. W. Gibbs, H. F. Ball and E. A. Benson.

3. Specifications for air-brake hose. To consider the advisability of adopting specifications of a lower grade than our present M. C. B. standard; to propose such specifications. It is suggested that the committee be composed of Le Grand Parish, J. S. Lentz, J. S. Chambers.

4. The economics of lubrication. To conduct a series of service tests of lubricating oils and journal bearings to determine the lubricating values of different grades of oils, and also the comparative service of journal bearings made of different mixtures. It is suggested that the committee consist of R. H. Soule, J. F. Deems, R. N. Durborrow, Samuel Higgins, J. T. Chamberlain.

5. The steel car. To consider the steel car from the construction and repair point of view. To submit a schedule of prices for labor and material for repairs of same, and also prices for settlement of cars destroyed. T. H. Russum, R. F. McKenna, I. N. Kalbaugh, E. B. Gilbert, George N. Dow. The report is signed by Messrs. C. A. Schroyer, Chairman; A. E. Mitchell, F. W. Brazier.

STANDARD REQUIREMENTS FOR HIGH-SPEED FOUNDATION BRAKE GEAR FOR PASSENGER SERVICE.

The committee decided to overlook what has been done by various railroads in the design of foundation brake rigging for high-pressure air-brakes and to make recommendations in accordance with the data available at the present time. It is thought that the designs herewith presented are entirely safe and that the weights of the parts are not excessive. The Hodge system of levers has been used as a basis, and the levers, rods and other parts are calculated for this system. If some other system of levers is used, it is recommended that the calculations be based upon the fundamental data which are given below. The designs have been submitted to the important air-brake manufacturers and have received the endorsements of such manufacturers.

Fundamentals.

Following are the fundamentals of the design:

Braking power to be 90 per cent. of the light weight of the car.

Equalized pressure in brake cylinder, 60 lbs. per sq. in.

Maximum pressure in brake cylinder, 85 lbs. per sq. in.

Maximum stress in levers, 23,000 lbs. per sq. in.

Maximum stress in rods, except jaws, 15,000 lbs. per sq. in.; no rod to be less than ⅞ in. in diameter.

Maximum stress in jaws, 10,000 lbs. per sq. in.

Maximum shear on pins, 10,000 lbs. per sq. in.

Diameter of pins to provide a bearing value not to exceed 23,000 lbs. per sq. in.

The reduction of stresses in rods, levers and jaws due to friction of the foundation brake, and the reduction of braking power due to the same cause and to the action of release springs, were neglected because it was considered to be too difficult to determine their value even with a fair degree of accuracy.

Six-Wheel Trucks.

Not knowing the weight of the lightest car carried on six-wheel trucks nor the weight of the heaviest, it was assumed that if cars weighing 80,000 lbs. to 137,000 lbs. were properly provided for then the actual limits of weight would be provided for satisfactorily. The higher limit of 137,000 lbs. was decided upon because certain pins and other parts would need to be increased in diameter in order to fulfil, for heavier cars, the fundamental conditions prescribed in the foregoing. The brake rigging designed for the cars having six-wheel trucks can be used to brake a car weighing 137,000 lbs. to 87.5 per cent. without exceeding the maximum stress prescribed.

The committee submit schedule "A-1" for cars weighing 80,000 to 100,000 lbs. and schedule "A" for cars weighing 100,000 to 137,000 lbs. and having six-wheel trucks. The difference between these schedules is that a 16-in. brake cylinder is to be used for schedule "A" and a 14-in. brake cylinder is to be used for schedule "A-1," otherwise they are the same. The location of the fulcrum hole in the cylinder lever is made to vary by quarters of the inch to suit the weight of the cars, but only one fulcrum hole shall be drilled in each lever.

With schedule "A" there should be used a brake-beam suitable for a load of 28,000 lbs., and with schedule "A-1" there should be used a brake-beam suitable for a load of 22,000 lbs. imposed at the middle of the beam.

Before deciding to recommend a uniform size of levers, rods and pins for all cars with six-wheel trucks and weighing from 80,000 to 137,000 lbs. there were laid out two brake riggings in accordance with the fundamental data decided upon. One rigging was designed for cars weighing from 80,000 to 100,000 lbs. and the other for cars weighing from 100,000 to 133,000 lbs., and the weights of the parts for each were calculated. It was found that the difference in the weights for the body parts was 57½ lbs. and the difference in weights of parts for two trucks was 67 lbs., a total of 124½ lbs. for one car. It was considered that economy would result from the use of one set of levers, rods, jaws and pins for all cars having six-wheel trucks and weighing from 80,000 to 137,600 lbs. instead of using two sets of levers, rods, jaws and pins for such cars, and the recommendations correspond with this idea.

It should be understood that wherever, in this report, reference is made to cars of certain weights having six-wheel or four-wheel trucks the committee does not recommend the particular type of truck for the particular weight of car; the committee merely accepts the conditions of weights of cars and types of trucks as it understands them to be at the present time.

Four-Wheel Trucks.

The greatest weight of cars equipped with four-wheel trucks was taken as 90,000 lbs. As for the cars having six-wheel trucks, two brake riggings were first designed, one for cars weighing from 50,000 to 70,000 lbs., and one for cars weighing from 70,000 to 88,000 lbs., and the differences in weights of parts were, for body parts 35 lbs., and for parts for two trucks 42 lbs., a total of 77 lbs. Therefore it was considered desirable to recommend one system of levers, rods, jaws, and pins for all cars weighing from 50,000 to 90,000 lbs. and having four-wheel trucks.

The brake rigging designed for cars weighing 88,000 lbs. can be used to brake a car weighing 90,800 lbs. to 87.4 per cent. without exceeding the maximum stresses prescribed.

Schedule "B-1" is for cars weighing 50,000 to 70,000 lbs. and having four-wheel trucks, and schedule "B" is for cars weighing from 70,000 to 90,000 lbs. and having four-wheel trucks, the differences between the two being that a 14 in. brake cylinder is to be used with schedule "B," and a 12-in. brake cylinder is to be used with schedule "B-1." With schedule "B" there should be used a brake-beam suitable for a load at the middle of 28,000 lbs., the same as for schedule "A," and with schedule "B-1" there should be used a brake-beam suitable for a load at the middle of 22,000 lbs., the same as for schedule "A-1." The proper braking power for the weight of car is obtained by the location of fulcrum hole in the cylinder lever.

Schedule "C" was designed for cars weighing 50,000 lbs. and less and equipped with four-wheel trucks. A 10-in. brake cylinder is to be used with this schedule and a brake-beam suitable for a load at the middle of 15,200 lbs.

Pins.

For all the schedules suggested there will be required a total of 8 different pins; one of the pins is a present M. C. B. Standard. Of the 8 there are 4 different diameters and the pins are numbered.

Rod Jaws.

There are 10 different rod jaws required for all the schedules and these are made of 4 different sizes of iron.

Designation of Rods and Levers.

The location of levers and rods are designated by letters, the first letter in the designation distinguishes between body and truck. The second letter distinguishes between the levers and the connections. The figure following the second letter is the distinctive number for the lever or connection; and following this figure is the schedule letter to which the lever or connection belongs. Thus B-C2-B means body connection number two (second from cylinder piston rod), of schedule "B"; also T-L2-B would mean truck lever number two for schedule "B." The levers might be so marked.

Marking Cylinder Levers.

It would be desirable to have marked on the two ends of cylinder levers the distance from the fulcrum hole to each of the outer holes. These distances can be measured easily and one of the reasons for recommending that the location of the fulcrum hole vary by ¼-in. spaces was to facilitate such measuring, but it would be convenient to have the lengths stamped upon the levers.

Stenciling Light Weight of Car.

The committee recommends that the light weight of car be stenciled on each car. The cross frame tie, when exposed, furnishes a convenient place on which to show the weight, but when this place is not available some other means should be provided. In addition to this the length of the cylinder end of the cylinder lever should be shown so that no calculation would be necessary to determine the proper cylinder lever for the car.

Marking Levers.

It may be found desirable by some railroad companies to mark each lever in a manner to indicate the schedule to which each belongs and the location of each in the brake rigging, and if this is done it is suggested that the marking be the same as indicated on the drawings. (Not shown.—Editor.)

Table I.

Schedule designation.	Light weights of cars, lbs.	Type of truck.	Size of brake cylinder, in.	Max. load at middle of brake-beam, lbs.
A.	100,000—137,000	6-wheel	16	28,000
A-1.	80,000—100,000	6-wheel	14	22,000
B.	70,000— 90,000	4-wheel	14	28,000
B-1.	50,000— 70,000	4-wheel	12	22,000
C.	50,000 and less	4-wheel	10	15,200

There have been brought together in Table I the distinctive data of each schedule so that by referring to the

table there can be found quickly the correct schedule for any particular car. The report is signed by Messrs. F. M. Whyte, Chairman; F. H. Clark, R. N. Durborow, J. W. Luttrell, C. A. Schroyer.

DRAFT GEAR.

At the convention of 1902 the committee gave as its opinion "that in order to fully carry out the instructions given by the Association as to the nature of a final report on the subject of draft gear, that a series of road tests is necessary, whereby a record can be kept for a given period of the repairs necessary to the draft gear itself and to the other parts of the car, independent of each other; also that a record be kept of the car mileage and tons hauled during that period."

The committee submitted to the members on Oct. 20, 1902, the following proposed form for keeping such records:

Master Car Builders' Association.

Report of.....R. R. Co. of Cost of Repairs to Cars Incidental to Maintenance of Draft Gear.

(1) Total No. of Cars..... (2) Kind of Cars.....
(3) Capacity..... (4) Maker's Name.....
..... (5) Kind of Gear.....

	Spring gear.	Friction gear.
(6) Repairs to Coupler, Complete—		
Steel	.....	.....
Malleable	.....	.....
(7) Repairs to Draft Springs, Followers, Stops, Pockets, Spindles and all other parts not included in Item 8	.....	.....
(8) Repairs of Draft Timbers, Draft Arms and Bolts for same	.....	.....
(9) Repairs to Center Sills	.....	.....
(10) Repairs of all other parts of car above floor, damage being due to shocks	.....	.....
(11) Total cost of repairs	.....	.....
(12) Mileage made during same period	.....	.....

It was thought best to confine these records to cars not to exceed two years old on July 1, 1902, and thus include modern cars and practically the latest designs of draft gear.

To this circular some 20 or 30 companies have replied, but the information obtained is so varied and incomplete that it is impossible to extract any reliable information that will be of value to the Association.

It is found that a great deal of experimental work is going on among the different railroads, on a large scale, with improved draft devices, both of the friction and heavy spring principles, and the records of railroads for these two types would indicate that they have not been in service a sufficient length of time to enable the committee to form any judgment whatever as to the final merits, and also that no reliable information as to the cost of maintenance can be obtained from the modern draft gear appliances that are being experimented with at the present time until they have been tested at least two years longer.

It is therefore impossible at the present time to submit drawings or designs which might be adopted as Recommended Practice covering either design. The report is signed by Messrs. E. D. Bronner, Chairman; G. F. Wilson, W. F. Keisel, Jr., A. L. Humphrey, Mord Roberts, T. A. Lawes, L. G. Parish, S. F. Prince, Jr.

CAST-IRON WHEELS.

The committee instructed to report on the design, weight and material for cast-iron wheels, for cars of 60,000, 80,000 and 100,000 lbs. capacity, find after three years of laboring with this proposition, much less difference of opinion regarding that most important question affecting interchange—the weight—than formerly existed. It is, however, confronted by some other propositions that do not leave the result of its investigation as conclusive as might be expected by the members of this Association.

For the purpose of getting an expression from as many roads as possible, the committee sent out a circular of inquiry asking for the information suggested in its last year's report. Record of all cases of breakage of wheels was desired, giving weight of wheel, capacity of car, character of breakage, and track circumstances as far as the grade is concerned; that is, whether the breakage occurred on a grade or near the terminus of a grade of given length. If any grades were found specially troublesome, a plan showing profile and curvature would be especially valuable.

In addition information relating to the hub dimensions, thickness of plates, size of ring core and contour lines of such wheels as are now in service and are giving the best success under cars of 60,000, 80,000 and 100,000 lbs. capacity was asked for. Each member was requested to break at least one wheel of each class that was found to give entire satisfaction under all conditions for their respective weights of car and fill in the dimensions of the broken wheel on an attached sketch, if a complete drawing of the wheel could not be furnished. Also a special letter of inquiry was sent to wheelmakers and roads operating their own wheel foundries.

There were submitted to the committee some 20 different designs of wheels for 60,000, 80,000 and 100,000-lb. cars that were recommended by the wheelmakers, or the roads using them, as giving satisfactory service and of which there was no special complaint to be made. After these wheel drawings were made full size on cardboard and cut out, it was surprising to see the difference in contour of the plates. This naturally raised the question, if the exact lines of plates were of any vital importance or had any effect on the life or wearing qualities of the wheel, and in the opinion of the committee it does not. The subject being interesting and to see what a composite wheel made from all of these good designs would look like, the wheels were grouped and those having the nearest lines plotted one over the other and a composite drawing made. These drawings were again plotted and a representative wheel worked out from them. These final wheels are shown by Figs. 1, 2 and 3, and while they might not give any better satisfaction than any of the designs from which they were made they certainly make a very handsome looking wheel and in the opinion of the committee would make a wheel at least equal to the best design now in use and one safe to be followed in making new patterns. These drawings do not show the composite lines for thickness through the throat, or hub lines, of the wheels submitted, but show these lines as recommended by the committee for adoption. Another drawing showed a section of the standard axle in place and the great variation in diameter of ring, cores and hub lines as they now exist.

It has been suggested by one manufacturer that wheels for cars of 100,000 lbs. capacity could be improved by changing the style of plate and there seems to be merit in this claim. A drawing of the wheel suggested was shown.

Figs. 4, 5 and 6 show the recommendations of the committee for hub lines, ring core, flange thickness and tread. It will be noticed there is a slight change recommended in the tread at the throat of the flange and on the outside of the flange. This change in the throat is not a new idea, but has been in use on a good many roads for several years and all of the reports the committee has received on this question favor its adoption. As the

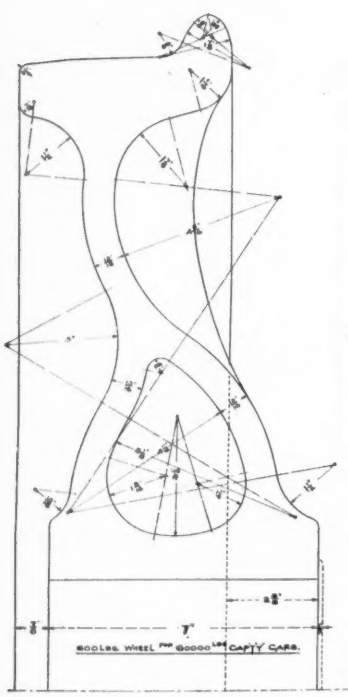


Fig. 1.

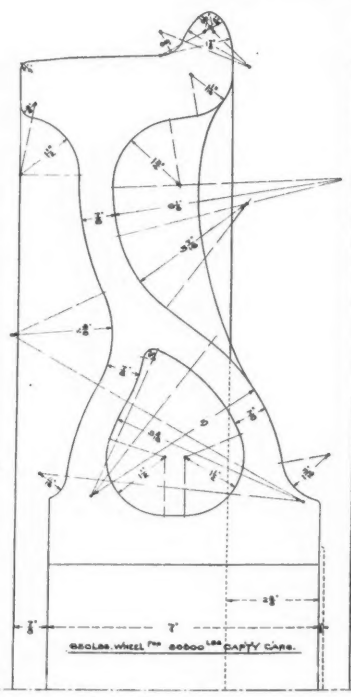


Fig. 2.

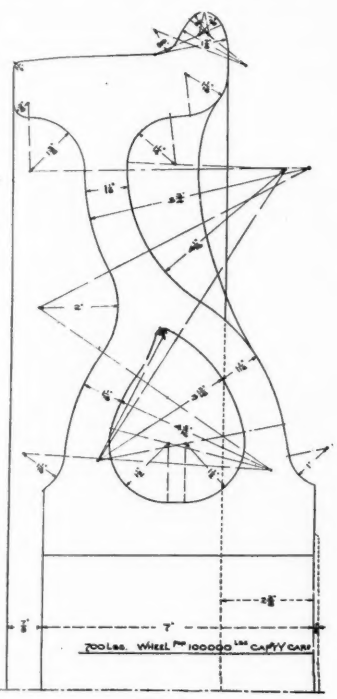


Fig. 3.

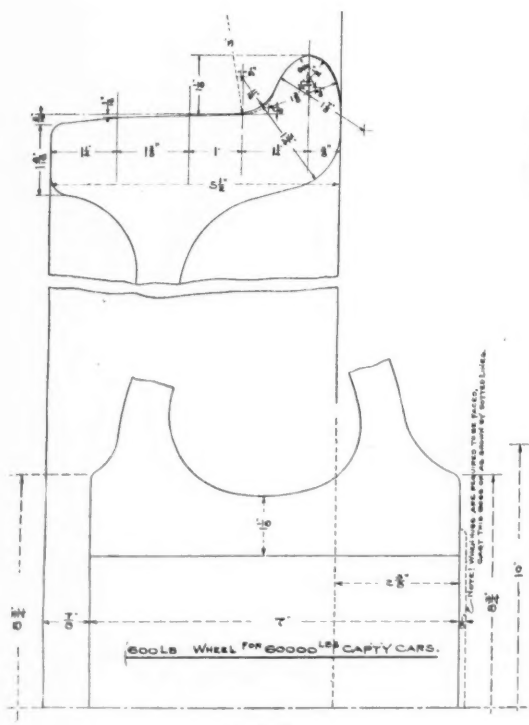


Fig. 4.

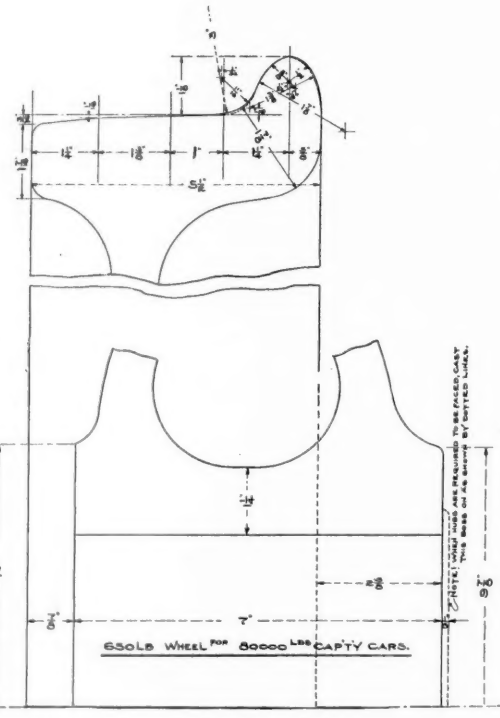


Fig. 5.

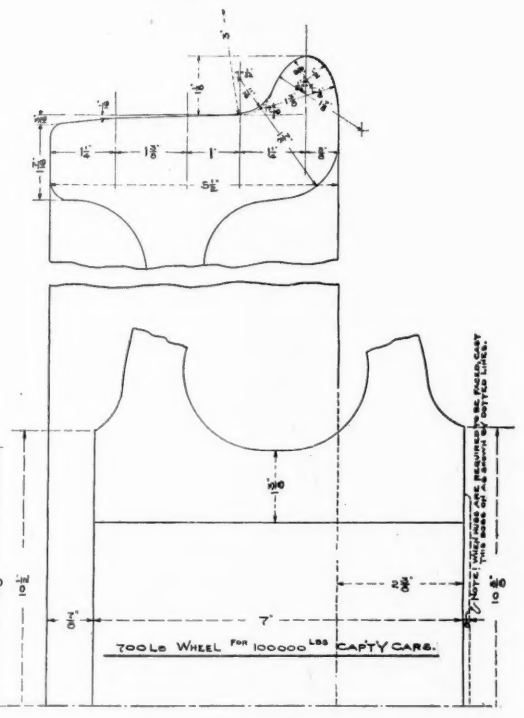


Fig. 6.

Cast Iron Wheels Recommended by the M. C. B. Committee.

greater radius throws the rail wear farther from the flange reducing wear at the throat, increases the thickness of metal where it is most needed, has a tendency to make a smoother casting and has been demonstrated by experience to be satisfactory in service, it seems a proper change to make in the interest of flange protection. The suggested changes in hub lines are made to meet the turning points of the standard car axle as adopted by this convention in 1902, and which are already adopted by a number of roads.

With very few exceptions the weights of wheels now in use are as follows:

600-lb. wheels under cars of 60,000 lbs. capacity
650-lb. wheels under cars of 80,000 lbs. capacity.
700-lb. wheels under cars of 100,000 lbs. capacity.

And there seems to be a large majority favoring the adoption of these weights as standard, with a greater number favoring an increase than are favoring a reduction in weight. The wheelmakers are almost a unit in favoring an increase over these weights for the 80,000 and 100,000-lb. cars, and those roads making a report of change in the weight of their wheels under the 80,000 and 100,000-lb. cars report the adoption of a heavier wheel. None report a change from a heavier to a lighter wheel.

The committee has gone into the matter of design without being able to come to any conclusions that would justify a reduction in weight without an improvement in the quality of metal used, and the question of quality of material to be used seems to be one that it is absolutely impossible for the committee or those roads not manufacturing their own wheels to control. As mentioned earlier in this report, the special cases where wheels are manufactured at home cannot be taken as a basis for the vast majority, who have to secure their wheels in the open market. Especially is this the case when the wheelmakers advise that any special brand or make of iron that should be specified would only result in a radical increase of price without a corresponding increase in the guarantee. The committee also believes that a specification of this kind would result in very serious delays and a final acceptance of wheels made of such iron as the manufacturer could secure of grades he has been accustomed to use and which he is willing to guarantee. Therefore the only recommendation governing this point is one limiting the per cent. of scrap to new iron used.

For the reasons given the committee recommends the following weights of wheels:

For cars of 60,000 lbs. capacity, 600 lbs.
For cars of 80,000 lbs. capacity, 650 lbs.
For cars of 100,000 lbs. capacity, 700 lbs.

With a minimum weight allowed in interchange of 580, 630 and 680 lbs., and further recommends that all wheels cast in the future have their normal weight cast on the outside plate in figures not less than 1¼ in. long and ⅛ in. high. It is the further recommendation of the committee that the present wheel specifications be changed to include the weights adopted for wheels for 60,000, 80,000 and 100,000-lb. cars; that they require the normal weight of the wheel cast on the plate in letters not less than 1¼ in. long; that the amount of old wheels allowed in mixture be not more than 60 per cent. of the total charge. That the chill be not less than ½ in. or more than 1 in. in the tread or throat.

That the drop test be changed to make the test a failure if the wheel cracks, checks or breaks, in the flange, ribs or plate, and that the test shall be 10 blows of the 140-lb. weight falling 12 ft. for 600-lb. wheels, or wheels for 60,000-lb. cars; 13 ft. for 650-lb. wheels, or wheels for 80,000-lb. cars; and 14 ft. for 700-lb. wheels, or wheels for 100,000-lb cars. The report is signed by Messrs. Wm. Garstang, Chairman; W. H. Lewis, William Apps, J. J. Hennessey.

TESTS OF M. C. B. COUPLERS.

Coupler Contour Gage.—The change made last year to strengthen the contour gage frames and which change has been adopted by letter ballot, has proven very satisfactory.

Testing Machine for Purdue University.—The testing machine furnished by the Association to Purdue University has been modified in such a way as to make it generally available for testing draft rigging, axles, etc., as well as couplers. Changes have been made with a view of getting a better jerk test, strengthening various parts and reducing their number.

Fig. 1 shows the general arrangement of the proposed jerk test machine.

Separate Knuckle Test.—For separate knuckle test, a large housing is provided in which the knuckle is held by various blocks and liners in two different positions for a striking and a jerking test. A steel striker extending through the top of housing delivers the blow from the drop weight to the knuckle. The arrangement may be attached to the M. C. B. drop testing machine and set up on the base block which is used for the draft-gear test. This block fits down between the base castings of the machine and both serve to raise the knuckle testing attachment to a good height for working around it and also allows the knuckle test to be made without removing the base castings and columns from the anvil.

In the knuckle striking test the back block and knuckle supports are placed inside the housing against the back and sides. The knuckle is dropped in between the supports and held by inserting a pin through the hole in the housing. Adjustment of the knuckle is then made by means of liners between the back block and the knuckle supports, and the knuckle supports are then lined up tight against the hub of the knuckle. Fitting pieces made to suit each type of knuckle are slipped in back of the tail for it to butt against, as the striker is driven down on the face of the knuckle. The knuckle blocks may also be put in against the back of the knuckle although the thrust is not in this direction, as in the jerk test. The housing is set into the test machine in the position as shown, in order to allow sledging on the end of knuckle pin, in case it becomes bent or for any reason is hard to remove.

In the jerk test the knuckle is put into the housing in the reverse position and then adjusted as in the striking test, except that the tail is lined out to the proper position by the striker blocks, and if necessary on account of its design, by a fitting piece, to furnish it with a bearing corresponding to the locking surface afforded in the coupler head. A test very closely resembling service conditions can be obtained for any knuckle.

Specifications.—The coupler specifications are not as generally followed as is desirable for the general good of the Association.

The committee has revised the existing specifications in order to obtain more logical sequence in tests and greater condensation in wording.

The first paragraph of the proposed specifications requires the couplers to be made of steel and thus disposes of the malleable-iron coupler. It also states that couplers should not be painted, which is an unnecessary process, and one without which a much better inspection can be made.

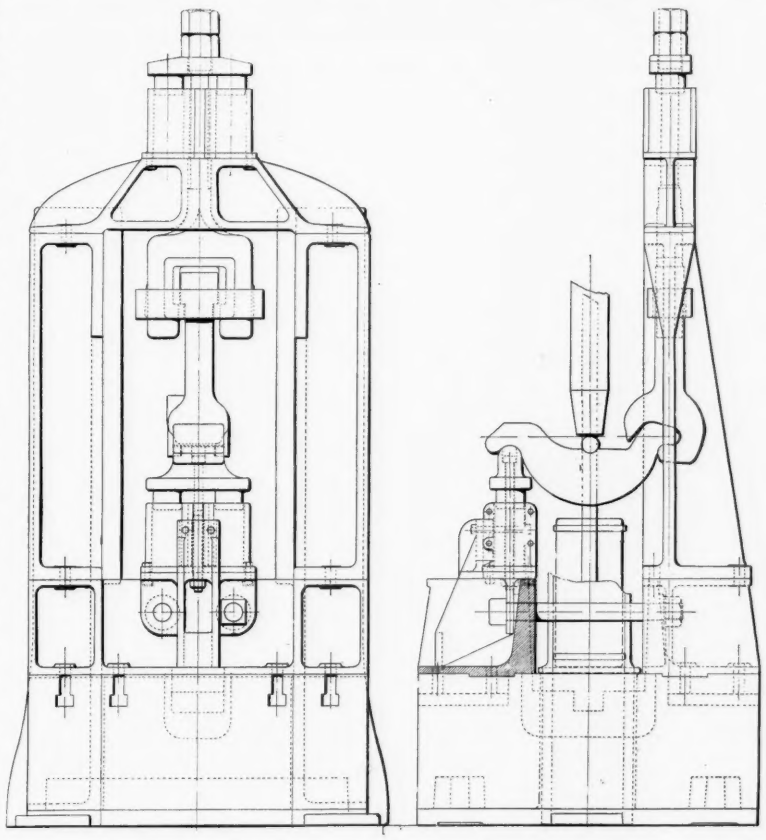


Fig. 1—General Arrangement of Proposed Jerk Test Machine.

Section 3 allows ⅛ in. vertical play between the knuckles and bars, instead of 1/16 in. This amount seems to be required to insure absolute interchangeability. Section 5 allows the pivot pin holes to be 1/16 in. larger than the pin, instead of 1/32 in., which seems to be more in accordance with what can be obtained in practice.

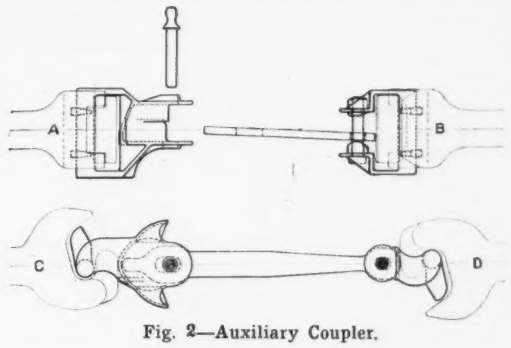


Fig. 2—Auxiliary Coupler.

It is difficult to cast raised letters and numbers on steel, and as the committee does not favor buying couplers on time specifications, it is recommended that the label be omitted and that the couplers be marked according to paragraph 7. The date of casting can be obtained, if desired, from the serial number.

The clause pertaining to minimum weights of couplers and knuckles has also been omitted.

In the striking test and for a 5 in. x 5 in. shank coupler in the guard-arm test 1⅞ in. is allowed for the distortion of the center-punched line, instead of 1 in. An analysis of a large number of tests has also shown that 7/16 in. distortion of the guard-arm should be allowed, instead of ⅜ in.

In the striking and the jerk tests more allowance is given by permitting a retest if the couplers, before failing, stand the first blow at 10 ft. instead of the second blow at 10 ft. The knuckle must not open more than ⅛ in. from its original position after the third blow at 10 ft.

Section 10 is made to include the guard-arm test. The failure of the guard arm should not condemn the other parts of the lot of couplers.

Uncoupling Attachment.—The lever handle should extend beyond the end of the end-sill, since an occasional cornering of cars always bends them when applied in the usual exposed positions, and often there is not sufficient space to operate the lever from the inside of a sharp curve, nor from the opposite side with an extended lever, if the end-sills are close enough to prevent the handles from being lifted. When the lever is used with couplers which require the lock to be supported by the uncoupling rod resting upon an inclined ledge, the committee recommends that an allowance be made so that there may be at least ¾ in. variation in the length of the uncoupling chain.

Steps should be taken toward singling out the best couplers, and the process should be started by specifying for new equipment only such couplers which have a lock set within the head and which do not depend upon the uncoupling lever to hold up the lock. This latter method, which depends entirely on the lift rigging being in exact adjustment, has been superseded by much better methods within the head of the coupler. The opinion seems to prevail that the lever should operate from both sides at either end of the car, thus affording more protection to the men. The arrangement which gives the man two chances to cut or couple the cars where with the single lever he has but one, should be used in connection with all freight equipment. Instead of extending one long lever across the end of the car, two short levers should be made and thus have less tendency to become inoperative, due to a slight bend, which is so often the case with a long lever extending through three brackets.

Solid Knuckle.—The objection to taking definite action in the matter of omitting the link slot and link pin-hole in the knuckle has been the difficulty of handling cars

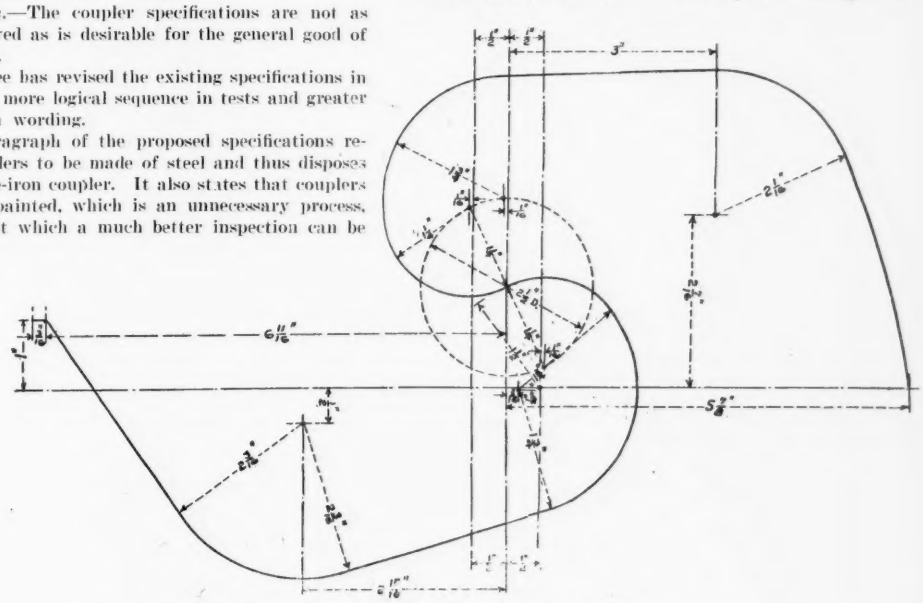


Fig. 3—Proposed Contour Lines of M. C. B. Coupler.

around sharp curves and on and off floats at tide water. An auxiliary device for this purpose is shown in Fig. 2. The short and intermediate sizes of bar A are for general use, while the long sizes are for the most extreme cases only. This device is applied by opening the coupler knuckle far enough to slip the casting around it; the knuckle is then locked by pushing on the bar or casting. The coupling is made with a pin, as shown between couplers A and B. Uncoupling can be performed either by lifting the coupling pin, which is generally free except when pulling, or preferably by unlocking the coupler from the side of the car by means of the lift-lever, in which case the released casting slips off the knuckle and is held suspended on the bar.

These couplers should be kept at the various curves where required, as is done with other special emergency devices now in use. Objection might be made to these couplers because the trainmen must go between the cars to make the coupling and in so doing would not be complying with the requirements of the Safety Appliance Law. This objection would be made either from a misinterpretation of the law, or would be due to a lack of clearness in meaning of the law itself, which "prohibits the use of any car not equipped with automatic couplers, so that they may be coupled without the necessity of a trainman going between the cars." It can hardly seem possible that this law could be so interpreted as to include the automatic coupling of cars in all positions and conditions of service, since a coupler was never known which could do this.

Changes in M. C. B. Coupler Contour.—The abandonment of the link pin holes and the link slot will transfer almost the entire breakage of the knuckles to the knuckle pin hole; also the lugs are the weakest parts of the bar. Increased strength at both of these places will be better obtained by an increase in section rather than in depth, since the metal around a deep hole will tear at the point of greatest shear as readily as it will around a hole of less depth of the same section. The present contour was designed for very much lighter service than it is now compelled to stand, and there is a limit to the additional strength that can be obtained with the present contour by improving the material in the coupler. The manufacturers are furnishing the strongest coupler that can be produced with the use of the old contour lines, which means that we must look to the only alternative for allowing the coupler to grow—that of increase in size. Drawbar lug failures will increase to even a greater proportion than is now the case. Pins become bent, which is one of the principal causes of lug failures, or the pin breaks off in the middle and the lower part drops out, which is largely responsible for the greater number of failures of the upper than of the lower lug. We need stiffer and stronger pins, which means increased section. We also need more metal around the pin, both in the bar lugs and in the knuckle, and this means increased section and a change in contour. This has been under consideration for some time and your committee now recommends the contour, as shown by Fig. 3, as the first of a series of changes that should be made at such intervals as the couplers will allow. The two distinct features involved in the proposed contour are, first, that the knuckle is made more hook-shaped, and, second, that about $^{3}/_{32}$ in. is gained across the contour at the pivot pin hole; in other words, the metal is taken from the front end of the knuckle, where it is not needed, and placed so as to increase the section across the pivot pin hole. The hook feature, as carried out in the proposed lines, will cause the couplers to wear together, rather than away from each other, thus reducing the liability to uncouple and allowing more change to be made in the direction of strengthening the section across the knuckle pin hole.

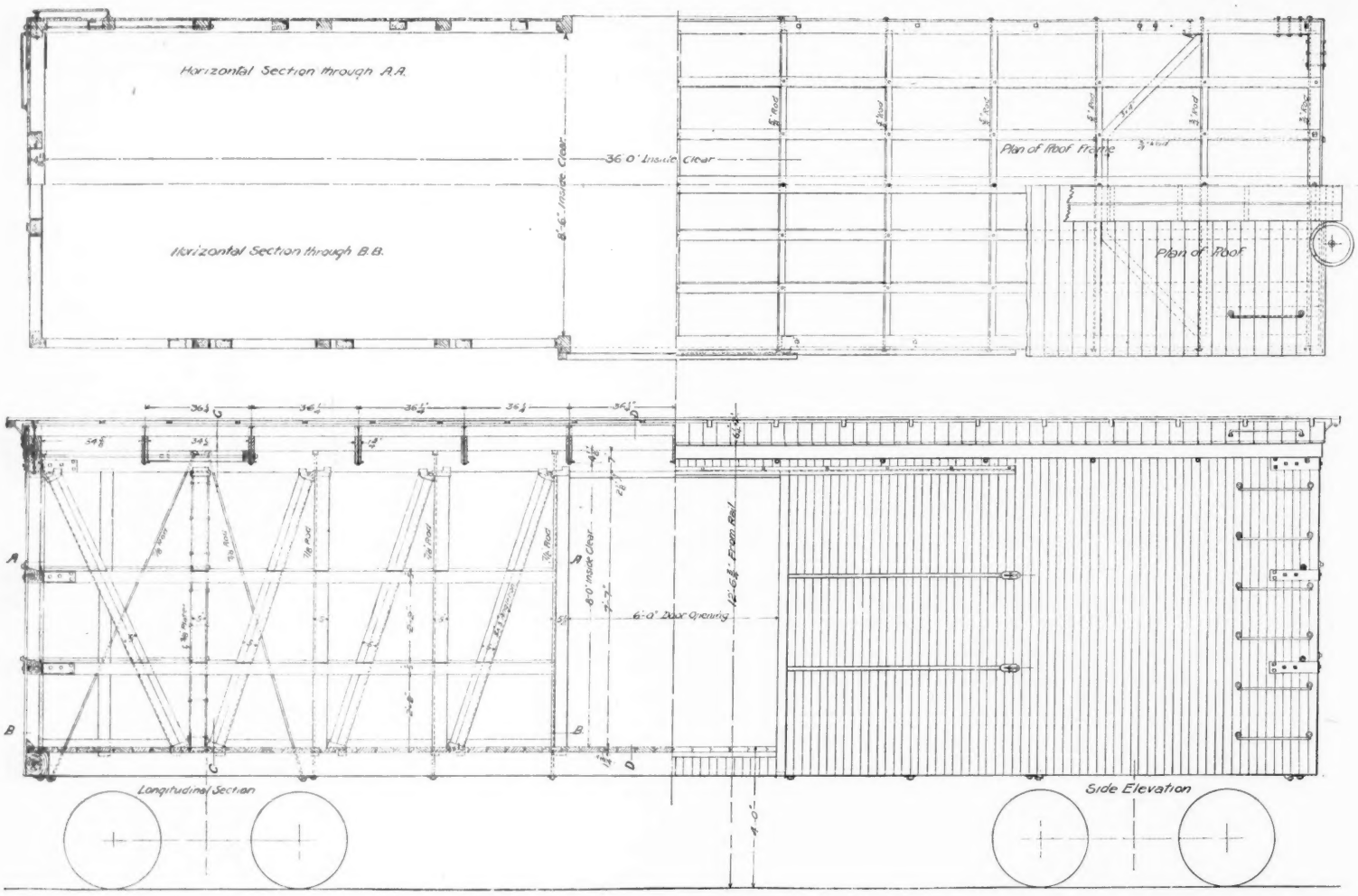
The report is signed by Messrs. R. N. Durborow, Chairman; W. P. Appleyard, Joseph Buker, W. S. Morris, F. H. Stark.

OUTSIDE DIMENSIONS OF BOX CARS.

The committee presents a design of box car which conforms to the inside dimensions as adopted by the American Railway Association, and is within the outside clearance dimensions as suggested by the committee last year.

The inside measurements adopted by the American Railway Association are: 36 ft. long, 8 ft. 6 in. wide and 8 ft. high.

The roof and door require the greatest space in construction known to the committee, so that by their use the maximum height and width are shown.



General Arrangement of Proposed Box Car Framing.

The design presented limits the inside lining and outside sheathing to $^{13}/_{16}$ in. each, the width of posts to 3 in. each, air spaces to ½ in. each, fascia to $^{13}/_{16}$ in. each and roof overhang $^{9}/_{16}$ in. on each side, which conforms to the recommendations made last year.

Assuming the side and end sills to be of wood, the pockets for posts and braces for the side of the car are made with lips, overhanging inside of side sill and held in their places by cleats nailed to the sill and running from pocket to pocket. The corner, end post and brace pockets are made with a tenon to fit mortise cut into end sill. The object of this is to get a better bearing for base of posts and braces to withstand outward pressure from the lading than can be gotten with pins cast on the pockets and fitted into holes bored into the sills.

The caps for top of side posts, corner posts, end posts and braces are also made with a lip to overlap the side and end plates respectively, and instead of using pins cast on the caps to keep caps from moving endways on the plates, the plates are gained ½ in. to receive the ends.

The side braces are stiffened with angle iron for bracing, and to protect the braces from outward pressure from the load, the angle irons extend the full length of braces. The pocket and cap have walls to keep the brace in place.

The posts over bolsters are stiffened with two ⅜ in. plates extending the full length of the posts and securely bolted to the same to keep the post from buckling outwardly, and thus giving a stiffer post for trussing the plate to the sill.

Assuming that two-thirds of the load is against the side of the car, then it is quite necessary that the tie rods should be equivalent to one-half of this in tensile strength to keep the side in position, and as many carlines used as rods to act as stops between side plates. The above assumption is based on loading the car with grain.

The end posts are strengthened by plates securely bolted to the posts and extending their full length, fitting into pocket and caps similar to side post and braces, and having a rod run through them, thus tying the end sill and plates together. The end braces extend from sill at end post to plate at corner post, fitting into the post pockets and caps.

To strengthen the corners at side and end plates, corner irons are placed inside and outside over sheathing and bolted together. This construction is applied at corners over each belt rail. Rods are used to tie side plates to end plates and corner posts to corner posts at each belt rail. Corner posts are also tied to side framing by rods at each belt rail, connecting with post above bolster. To assist in stiffening the ends of the car a truss is placed between the first and second carline and the side plate of each end, with two rods, each connecting to end plates.

As stated in the introduction of this report, it is hoped that the plans shown herewith will excite the fullest criticism; they are not presented for adoption as a standard or recommended practice. If you think they are faulty, your committee wishes to know wherein the fault lies and the reasons for your belief. If you have any suggestions to make, the committee would be pleased to receive and consider them. It is believed that a standard box car is feasible and advisable, but it can only be brought forth after all differences of opinion have been explained away.

The committee would confirm the recommendations of last year's committee regarding the adoption of certain dimensions as standard.

The report is signed by Messrs. Joseph Buker, Chairman; W. P. Appleyard, G. W. Rhodes.

STANDARD PIPE UNIONS.

The committee was instructed to correspond with manufacturers, presumably with a view to suggestions and criticisms. As this was very thoroughly done by the committee of the American Society of Mechanical Engineers, before making their final report, your committee has received no suggestions which had not been previously considered.

The report is signed by Messrs. C. H. Quereau, Chairman; W. H. Lewis, Thomas Fildes.

COLLARLESS JOURNALS.

The committee prepared and submitted to the members a circular embodying the following questions in order to collect data on which to base its report to this convention:

Q. No. 1.—How many freight cars have you equipped with collarless journals; how many passenger cars have you equipped with collarless journals?

Replies.—Replies from 31 members, representing 640,608 freight and 14,629 passenger cars, show that 2 per cent. of the freight and 15 per cent. of the passenger equipment represented are equipped with collarless journals.

Q. No. 2.—State the number of hot boxes for six months found under passenger cars with collarless journals and

under passenger cars with collar journals; state the number of hot boxes under freight cars with collarless journals and under freight cars with collar journals, for a period of six months.

Replies.—Only 9 members made reply to this question; they represented 4,541 passenger and 204,739 freight cars. Thirty-two per cent. of the passenger and 2 per cent. of the freight cars represented in these replies were equipped with collarless journals, whereas 26 per cent. of the hot boxes on passenger and 1 per cent. of the hot boxes on freight cars were on the cars equipped with collarless journals.

Q. No. 3.—Do you use the same dust guard and same lid for collar and collarless journals under passenger cars and same lid for collar and collarless journals under freight cars.

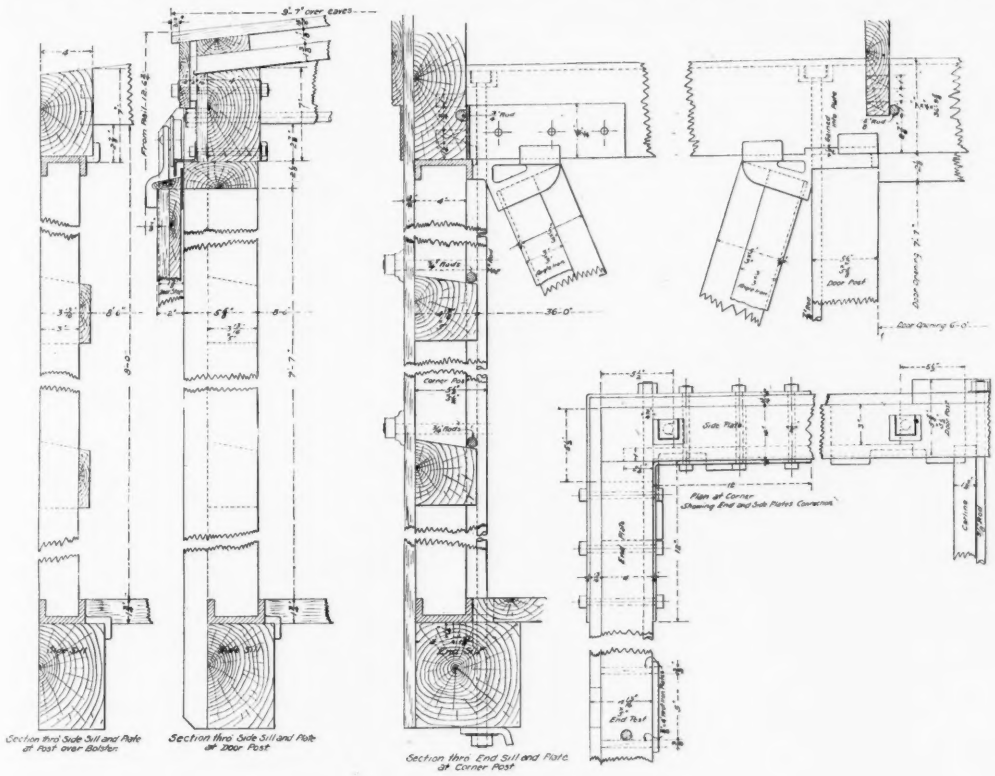
Replies.—All roads, but one, making reply advise that they are using the same dust guards and lids, for both passenger and freight cars, with collar and collarless journals.

Q. No. 4.—State whether you use filled bearings, solid bearings or solid bearings lead lined with collar journals and with collarless journals; in other words, are the same bearings used with both kinds?

Replies.—All roads replying state the same kind of bearing is used with both kinds of journals.

Q. No. 5.—How many collar journals have you found broken under passenger and freight cars, separately, for a period of six months; how many have been found for the same period having collarless journals, due to the fillet being worn at the back?

Replies.—Replies cover 135 cases of broken journal



Details of Proposed Box Car Framing.

freight cars with collar journals, and 8 under cars with collarless journals; no cases reported of broken journals under passenger cars during the period mentioned.

Q. No. 6.—Is difficulty experienced in inspecting the journal bearings on account of journal bearing key covering part of the end of the journal where collarless journals are used, and is the difficulty greater than where collar journals are used?

Replies.—Of the members representing cars equipped with collarless journals, who made reply, 9 advise it is more difficult to inspect the journal bearings on account of the journal bearing keys used with the collarless journal, and 5 that there was no difficulty experienced.

Q. No. 7.—Do you find trucks keep square as well with the collarless journals as when the collar journals are used; the natural tendency of the collarless journal being to cause the trucks to spread, while with the collar journal the trucks are held square.

Replies.—Nine members reply that trucks keep square as well with the collarless journals as with the collar journal, and 5 members advise that they do not.

Only 31 members made reply to our circular letter of inquiry; and several members were not in position to furnish the data as called for by the circular.

The committee desires to call attention to question No. 6, and the replies thereto; that the end of the journal bearing keys used with the collarless journal not only prevents proper inspection of the journal bearing and packing, but certainly interferes with the oilers giving to the packing, at important termini, the attention necessary to maintain the efficiency of the packing. This is more particularly true of the packing at the side and rear of the box, which can be readily appreciated by all who are familiar with the conditions surrounding this type of journal, due to the lack of space between the side of the journal box and the journal. This feature of maintaining the elasticity of the packing is becoming more essential with the increased loads and speed of trains of the present day, in order to overcome hot boxes, the danger of which is increased with the speed of the train.

It has been thoroughly demonstrated that the highest efficiency in lubrication is obtained, not by the simple process of adding more oil to the box, but by thoroughly maintaining the packing in a loose and elastic condition in order that the oil may be freely conveyed from the packing to the journal. It has also been shown that, in most cases, the cause of hot boxes is due to the bad condition of the packing at the side and rear of the box, and that the only remedy is a systematic and efficient treatment of the packing to overcome the glazed or hardened condition resulting from too long contact with the journal, rather than by applying more oil.

The committee is of the opinion, based upon past experience, that the M. C. B., or collar type of journal, is almost a necessity to insure intelligent inspection and proper care of the packing in the journal boxes.

Attention is called to the excessive end play with the collarless journal, allowing the brass to swing out over the end of the journal, thereby bringing the load farther from the fulcrum and causing a greater strain on the axle than is the case with the collar journal where the end play is limited. The report is signed by Messrs. F. W. Brazier, E. D. Nelson, F. H. Clark.

PROPOSED STANDARD PEDESTAL AND JOURNAL BOX FOR PASSENGER CARS FOR 5 IN. X 9 IN. JOURNALS.

The committee, appointed to submit a proposed design for pedestal and journal box for passenger cars for 5 in. x 9 in. journals, submitted designs shown on drawings accompanying the report. The report was signed by Messrs. J. R. Slack, Chairman; T. B. Purves, Jr., Wm. Renshaw.

CAR LIGHTING.

On account of the retirement of the chairman, Mr. Canfield, from railroad service, Mr. R. D. Smith accepted the chairmanship of the committee, and about four months ago the committee, including Mr. D. F. Crawford and Mr. T. S. Lloyd, commenced investigation. The committee mailed a circular of inquiry to all members of the association in reference to the cost of car lighting with the different systems in use on their respective roads. The unit used was the cost of lighting one car per year. It was realized that this was not a satisfactory unit upon which to base results, because of the fact that the amount of illumination varies greatly in different cars. It was thought, however, that this unit would afford a certain degree of comparison between different systems, but when replies were received to the circular sent out it was evident that the information on the subject was limited and it is now apparent that the only unit is that based upon the actual candle-power. In order to obtain figures which are comparable it would be necessary to conduct a series of tests on cars lighted by the various methods and these tests should be conducted in a similar manner. It would necessitate keeping an accurate account of the cost of operation and maintenance as well as the power of illumination and such tests would necessarily occupy much time.

The modern systems of lighting are the result of private enterprise and it is apparent that the committee could not recommend any specific system without presumptuous unfairness to other creditable systems. On this account the committee could not make a recommendation that it would be advisable for the association to adopt even if tests had been conducted and report of same made. After careful consideration of the matter the committee is convinced that a series of tests of this kind is not within the province of the association. All that could be done by the committee with propriety would be to present a paper describing the different systems of car lighting and this was ably done by Mr. Canfield in last year's convention. Since that time the ground has been thoroughly covered by papers presented before the different railroad clubs as well as by the technical journals, so that anything we might do in this line would necessarily be largely repetition. The committee therefore requests that it be discharged. The report is signed by Messrs. R. D. Smith, Chairman; D. F. Crawford, T. S. Lloyd.

SUPERVISION OF THE STANDARDS AND RECOMMENDED PRACTICE OF THE ASSOCIATION.

There still seems to be no generally expressed desire for material changes in our present practices. It has been the established practice of this committee in the past, to discourage changes unless a clearly shown error or inconsistency existed in the established standards or recommended practices.

As a result of the committee's canvass, the following comments and recommendations are made:

1. Suggestions were made to the committee that the standard journal boxes for 5 in. by 9 in. and 5½ in. by 10 in. journals should provide for a journal box bolt larger than the one at present in use. The committee finds the general opinion opposed to such change, and experience seems to indicate that the present sizes of bolts are giving generally satisfactory results.

2. The text in connection with standard siding, roofing and lining, page 460, is not consistent with the drawing, Sheet M. C. B.—19. After correspondence with the committee which originally proposed and designed this standard, it would appear that the dimensions as shown on Sheet M. C. B.—19, are correct, and consistent. The committee therefore recommends that, to correct the error in the text, it be made to read simply, "Siding, roofing, and lining, shall be of the section shown on Sheet M. C. B.—19." The balance of the present text to be omitted.

3. It has been suggested to substitute letters for figures, for reference to the defects as shown on the standard air-brake repair card, in order to avoid the confusion arising from the use of figures on the stubs. The figures 1 and 2 unless carefully separated by a dash are easily confused with 12, and similarly 1 and 3 are confused with 13. If letters A, B, C, etc., are substituted no such confusion can result. The committee recommends this change.

4. Inasmuch as the American Railway Association has established standard inside dimensions for box cars, and as the dimensions shown in the M. C. B. Association Recommended Practice for cars with steel underframes is at variance and inconsistent with the American Railway Association standard, the committee recommends that this recommended practice be eliminated.

5. The committee recommends that the Recommended Practice for journal bearing and wedge gages, Sheet M. C. B.—C., be advanced to a standard of the Association.

6. The committee recommends that the Recommended Practice for specifications for air-brake hose be advanced to a standard of the Association and that the label be modified so as to include the letters "M. C. B. STD.," these initials to be applied only on hose that are made to strictly conform to the requirements of the M. C. B. Standard specifications.

7. The committee also recommends that standard label for air-brake hose as shown on Sheet M. C. B.—9, be modified by lengthening it to provide for the official mark "M. C. B. Std.," which is to be used to designate hose made to conform to the standard specifications of the M. C. B. Association.

8. The committee would also recommend that the Arbitration Committee have a provision put in the Rules of Interchange providing that air hose applied to foreign cars shall be considered as "wrong repairs," unless they are made in accordance with the M. C. B. standard specifications and are so labeled.

9. The committee recommends that the M. C. B. wheel defect gage, as shown in Fig. 1, page 370 of the 1902 Proceedings, be adopted as an Association standard. The adoption of this later form of gage will make the old form of gage obsolete.

10. The committee finds a strongly expressed desire for similarity in style and location of the marking, and uniformity in stencils for stenciling the names, numbers, capacities, weights, etc., on different styles of cars. A committee has recently been appointed by the Master Car and Locomotive Painters' Association to consider this subject. We would recommend that this Association appoint a committee on this subject to take it up in its broadest sense, with a view of incorporating in its report our present standards of practice, or such modifications of them as may seem desirable, and also to cover all necessary features connected with freight car marking. The special committee to confer with the committee from the Painters' Association, and to present for adoption standard stencil alphabets of the various necessary sizes. The report of the special committee to be submitted for adoption as recommended practice for one year, and then if found satisfactory to be advanced to a standard of the Association.

11. We recommend that a committee be appointed to submit to the 1904 convention details for a standard M. C. B. emergency coupling chain, for chaining together

double loads, and for use in chaining together cars where the couplers have been pulled out.

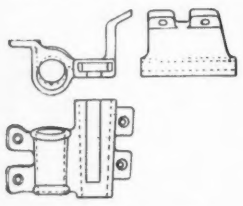
12. A resolution was adopted at our last convention looking to the abandoning of the link slot and the link pin hole in the M. C. B. knuckle. It is hoped that the committee on tests of M. C. B. couplers may be able to definitely recommend this change for submission to letter ballot for adoption at this meeting.

13. We recommend that a special committee be appointed to revise the air-brake and signal instructions, and to bring them up to date; this committee to advise with a similar committee from the Air-Brake Association.

14. We recommend that a special committee be appointed to submit designs and recommendations looking to the adoption of standard styles and dimensions for stake pockets.

The report is signed by Messrs. A. M. Waitt, Chairman; T. W. Demarest, T. S. Lloyd.

The committee recommends the use of combination bracket and socket and flag-stick holder (see illustration), which will accommodate the various lamps in use, without interfering with the clearance dimensions, and will receive a flag stick which will avoid the necessity of carrying a supply of flag-stick holders.



Combination Bracket and Socket.

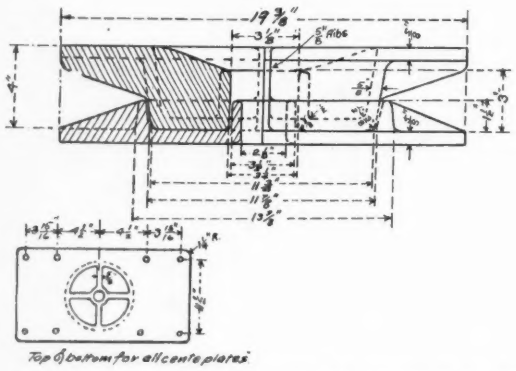
All signal-lamp brackets and sockets should be on the body corner posts of all open and narrow vestibule cars, and on vestibule corner posts of all wide vestibule cars at a distance of 5 ft. from the bottom of side sill to center of signal-lamp bracket or socket and as near the center line of the corner post as is possible. Owing to the different widths of cars, lamp-bracket arms, etc., some roads will have to shift the brackets slightly from the center line to suit conditions. This will give satisfaction on both vestibule and open cars.

The report is signed by Messrs. W. F. Bentley, Chairman; F. W. Brazier, W. P. Appleyard.

SIDE BEARINGS AND CENTER PLATES.

The principal problem before the committee was to obtain information which would enable it to recommend to the Association a design of center plate to meet the conditions of service. The testing machine in use last year was reconstructed. The tests were not confined to center plates, but were also extended to side bearings.

The machine consisted of a vertical head in which was set a 40-ton hydraulic jack working against a movable lower head, a lever beam, and the upper head. The upper head was composed of several layers of steel and wood in two parts, separated by four 19,000-lb. capacity springs to allow adjustment. The beam was swung back and forth by two 6 in. air hoists, to which were attached indicators and the cards taken gave the basis for the calculations.



Standard Center Plate Recommended by the M. C. B. Committee.

For the center plate tests the beam swung about the center line of the head, giving a lever arm of 113¼ in. For the side bearing tests a center was provided 25 in. from the center of the machine, or the usual distance from the center pin to side bearing, the lever arm in this case being 138¼ in. The travel of the beam was 67 in. each way or 34 deg. for center plates and 30 in. or 12 deg. for side bearings. This movement is, of course, greater than would be met with in service, but as few of the conditions of service could be provided for in a test of this nature, it was thought best to use this exaggerated movement in order to obtain the greatest possible effects of the friction. There were a number of plates from which no results were obtainable. Two pair of center plates and side bearings were used, in every case one pair being below the beam and one pair above. The upper plate of the lower pair and the lower plate of the upper pair were bolted to the beam. The other plates were prevented from swinging by guides bolted on either side of the heads. The pressure was measured by a 6,000-lb. capacity hydrostatic gage connected at the base of the jack.

While a large number of cards were taken (about 3,800) and the plates were tested under conditions that they would not have to meet in service, some more favorable and some more unfavorable, it is very evident that only the first step has been taken in the solving of this important problem. The variation in the results is, in many cases, too great and irregular to justify any hard and fast statement of facts. With the machined plates, the areas of contact were not the same in both pairs of plates in the machine at the same time, and the almost certain unreliability of estimating or measuring the very irregular areas of contact. A reason for disregarding the varying areas of contact was the desire to test and report on the plates under the same conditions that they would be applied in service. The effects of lubrication would be expected to be plainly and uniformly evident, but such is not the case. While the beneficial effects of lubrication cannot be disputed and are in the main borne out by the figures submitted, there are still wide exceptions.

In summing up the results obtained, the minimum flange resistance was obtained with the flat plate (shown herewith) of chilled cast iron. The projected area of this plate was 100.14 sq. in. In order to determine the best size six different plates were made ranging in area from 100.14 sq. in. to 46.793 sq. in. The results obtained, as noted in the tables and on the cards, are so close that it is difficult to say which will be the best area to adopt. Apparently, the flat plate with an area of 86.738 sq. in., using as a basis a smooth casting, no lubrication, gave the best general results, and a flat plate of this description is recommended to the Association as the standard form of center plate.

Two ball bearing center plates were tried. These center plates gave such remarkable results that there can be no question of a reduction in flange resistance by their use. One road has been using for a number of years now a ball bearing center plate, and in so far as durability is concerned, the plates are reported as giving entire satisfaction. It is recommended to the Association that during the coming year the members equip a number of cars with ball bearing center plates, in order to ascertain more fully their durability.

A number of side bearings were also tried, but these experiments could not be completed. The results indicate very much less flange resistance with the roller side bearings than with the ordinary flat cast iron plate.

There is no doubt in the minds of the committee that if the ball bearing center plates and side bearings are durable in service a very greatly decreased flange resistance will be obtained.

The report is signed by Messrs. T. W. Demarest, Chairman; A. E. Benson, J. W. Luttrel, G. N. Dow.

STEAM AND AIR LINE CONNECTIONS.

The committee broadened the scope of the work, including in its investigation the size of steam train pipe and other data which had a direct bearing on it. This was done with the view of recommending a standard size of pipe as well as location of connections, all of which, if adopted by the Association would permit of changing present equipment at one time and at least expense.

A circular of inquiry was sent to all members of the Association with replies as noted after each question, containing the following questions:

1. Diameter of steam pipe?
2. Inside diameter and length of steam hose?
3. Style of steam hose coupling; straight port or not?
4. Smallest inside diameter of steam hose coupling?
5. Diameter of gasket opening?
6. Coupling gaskets; removable or non-removable without taking coupling apart?
7. Do you experience any trouble with couplings parting?
8. Do you favor a locking attachment for couplers?
9. Is a trap in coupler necessary?
10. Should gaskets have a metal lining to avoid reduction of diameter?
11. What is the best composition for steam hose gaskets?
12. What is the effect of reducing the diameters at couplings below train pipe diameters?
13. To what extent are you using metallic connections between cars and with what success?
14. Style of train pipe valve, whether end valves or center valve are used?
15. Area of smallest opening through train pipe valve?
16. Have you had any experience with train pipes without train pipe valves?
17. If so, with what results?
18. Vertical or horizontal traps, which style used?
19. Are single or double traps desirable? Why?
20. Do thermostatic traps regulate the temperature to the extent necessary to keep the cars uniform in temperature or is it necessary to use, in addition, an inlet controlling device?
21. Is the leakage from traps detrimental to the varnish and paint and is it objectionable at depots?
22. What is the lowest steam pressures with which you have been able to heat trains successfully, at zero weather, of 8, 10, 12, 14 and 16 cars?
23. What system of ventilation is used in connection with steam heat?
24. Square feet heating surface to 100 cu. ft. of car space?
25. Steam pipe covering—kind?
26. Size of steam admission valves?
27. Method of hanging pipes and securing them to car body?
28. Size of steam pressure regulator on engine for a given size of pipe?
29. Kindly advise what figures, "A" and "B," it is necessary for you to have to enable the steam heat and air brake pipes to be located as shown in reference to the signal pipes, provided dimensions "C" and "D" do not exceed 1½ in.?
30. Can dimensions "C" and "D" be reduced below 1½ in. in your equipment without excessively large changes in "A" and "B" from the figures shown on the diagram; if so, how much?

With one exception, all of the roads represented in the replies to the circular of inquiry are using 1½ in. diameter steam train pipe. This size of train pipe was adopted by many roads when steam for heating their passenger trains was first introduced and when trains consisted of six and eight cars. With the use of heavier locomotives the length of trains has been practically doubled, but with no corresponding increase or change in diameter of train pipe, with the result that on some roads, pressures for heating trains are being used up to 90 and 100 lbs., and with results not entirely satisfactory.

It is difficult to heat the rear cars of long trains; excessively long stops are required at division terminals to get steam through the train after changing engines, and with the high pressures used, the steam hose is subject to more rapid deterioration, resulting in delays on the road from burst steam hose, not to say anything about the increased cost of maintenance.

The time appeared opportune to consider the matter of enlarging the diameter of the steam train line and with this in view a series of tests were conducted at Collinwood, O., on a train of 16 passenger coaches during the months of February and March.

The tests may properly be divided into four principal investigations, namely:

1. The investigation of the steam hose coupling, or a comparison between gasket openings of 1½, 1¼ and 1⅛ in. diameters with regard to their steam obstructing qualities in connection with 1½ and 2 in. diameter train pipes.
2. The investigation of the train line, or a comparison between a 2 in. and 1½ in. train line with regard to their steam obstructing qualities, and their abilities to maintain a line pressure and provide steam to the radiators.
3. The investigation of the admission valve, or a comparison between a valve having a 1 in. diameter opening and one having a ¼ in. diameter opening, to determine their steam obstructing qualities (when open) on the train line, and their abilities to provide steam to the radiators.
4. The investigation of steam pressures, or a comparison between the effect of low pressure on the 2 in. line and high pressure on the 1½ in. line.

The apparatus for making these investigations consisted of the following: A train of 16, 52 ft. passenger coaches, total length of train being about 900 ft., each car being equipped with both the 2 in. and 1½ in. train pipe.

The cars were provided with 1 in. steam inlet controlling valves, and for the ¼ in. diameter inlet opening, connection was broken and a copper gasket used with a ¼ in. diameter hole in it.

New steam gages, carefully calibrated, and located about the center of each car, were provided.

Each car was equipped with three thermometers, one at each end and one in the center of the car, suspended from the ceiling. Thermometers were carefully calibrated.

The train was placed on a special track near the power house of the Collinwood locomotive shop plant, in an exposed position, running east and west and having nothing on either side for its entire length to obstruct wind and weather.

Steam at 150 lbs. pressure was obtained through a 3 in. line from the power house, connection to the train being made exactly as with a locomotive, namely: a globe valve and 1 in. pipe to pressure regulator and 1½ or 2 in. pipe outlet to train line, with steam gage. Between the regulating valve and end valve of train, connection was made with a ¾ in. air pipe with globe valve; through this line air at 90 lbs. pressure was obtained for blowing out steam pipe, to obtain constant temperatures at the termination of tests.

In the log of results, the tests are classified in alphabetical order and will be referred to in that manner. Many of the tests were conducted at night time, with a view of getting constant temperature conditions.

Tests A, A-1, A-2.—2-in. vs. 1½-in. Train Line, 1½-in. Hose. Line Obstruction Test. Inlets Open.

Test A: 1⅛-in. Hose Coupling Gasket.
—Rear car.—

	Time to get water.	Time to get steam.	Time to get 10 lbs. in 16th car.	Time to get 10 lbs. in 15th car.	Outside temp'ture.	Initial pressure.
	Min.	Min.	Min.	Min.	Deg.F.	Lbs.
1½-in. line....	11.5	13.5	No pressure		40	80
2-in. line.....	6.5	8.0	38	30	37	80
Test A-1: 1¼-in. Hose Coupling Gasket.						
1½-in. line....	10.2	11.0	No pressure		50	80
2-in. line.....	3.4	4.5	16	13	43	80
Test A-2: 1½-in. Hose Coupling Gasket.						
1½-in. line....	10.0	10.5	No pressure		40	80
2-in. line.....	3.0	4.0	11	9.5	47	80

This test consisted of comparing the 2 and 1½ in. train lines as to their steam obstructing qualities. Inlet controlling valves were all left open and each line was tested with the 3 different sizes of hose coupling gaskets, there being 3 tests for each size of coupling gasket and the average of the 3 taken for the data.

This steam obstructing test was conducted as follows, it being the intention to have the conditions the same as obtained in changing engines at division terminals: All

connections being tight, valves at end of train open, pipes hot, inlet controlling valves open, steam was turned on and time noted, pressure being kept constant at the regulating valve. At the appearance of water at the rear end of the train, the time was noted, also the time when dry steam appeared. Four minutes after the appearance of water the end valve was closed and the time noted when the steam pressure reached 10 lbs. on the gages of the 16th and 15th cars. This completed the actual test.

Steam was then turned off at head end of train, valve at rear end opened, allowing all steam to escape and time noted 15 minutes after steam was turned off. It was then turned on and the same process repeated three times for each size of coupling gasket.

Comparison of the 2 in. and 1½ in. train line with regard to their steam-heating qualities. The test was conducted as follows: Train being cold, doors and windows all closed, inlet valves closed, steam was turned on as before. At the appearance of dry steam, the rear end train pipe valves were closed, and five minutes thereafter the inlet controlling valves were opened in rear car, first taking the readings of the pressure gage and the three thermomters in the car.

When dry steam appeared at trap the blow-out valve was closed and pressure again noted. Five minutes after the opening of the inlet controlling valves in the last car, those in the next car were opened and the same method of procedure followed for this and each car in the train. Readings of pressures and temperatures were taken in each car every thirty minutes after inlet valves were opened for two hours. At the end of test doors and windows were all opened, cars allowed to cool, steam blown out of the train by means of the air line, inlet valves then closed, after which the next test was started.

In the log, the "degrees raise per minute" column was found by dividing the rise in temperature by the number of minutes it required to make the rise.

The "pressure drop per cent." column was found by averaging the pressure readings in each car during the run, subtracting from initial pressure to find the drop and dividing the drop by the initial pressure to get the drop percentage. The initial pressure is the gage pressure at head end of train corresponding to steam heat gage in cab.

Comparison of the 1 in. and ¼ in. diameter inlet valve openings with regard to their abilities to furnish steam to the radiators. Test conducted in the same manner as tests B and B-1.

Tests D and D-1.—1-in. vs. ¼-in. Inlet Valve Opening. Line Obstruction Test.

Test D: 2-in. and 1½-in. Lines with 1½-in. Hose and 1½-in. Coupling Gasket.

	Time to get water.	Time to get steam.	Time to get 10 lbs. in 16th car.	Time to get 10 lbs. in 15th car.	Outside temp'ture.	Initial pressure.
	—Rear car.—					
	Min.	Min.	Min.	Min.	Deg.F.	Lbs.
1-in. inlet, 2-in. line	3	3.5	7.5	7	50	40
¼-in. inlet, 2-in. line	1.25	1.5	4	3.5	40	40
		Test D-1.				
1-in. inlet, 1½-in. line	23	24	No pressure		50	80
¼-in. inlet, 1½-in. line	10	10.5	No pressure		40	80

Comparison of the 1 in. and ¼ in. diameter inlet valve opening as to their steam obstructing qualities. Each size of inlet opening was tested on the 2 in. line and 1½ in. line. Inlet valves were all open and test conducted as in tests A, A-1 and A-2.

Comparison of the effects of a 30-lb. initial pressure on the 2 in. line with 80 lbs. pressure on the 1½ in. line. Tests conducted in same manner as tests B and B-1.

Test F.—1½-in. Hose Couplings with 2-in. Line. With Trap vs. Without Trap.

Test F.

	Time to get water.	Time to get steam.	Time to get 10 lbs. in 16th car.	Time to get 10 lbs. in 15th car.	Outside temp'ture.	Initial pressure.
	—Rear car.—					
	Min.	Min.	Min.	Min.	Deg.F.	Lbs.
Hose couplings with traps	5.5	6.25	7.3	7	55	40
Hose couplings without traps	4.17	4.75	7.16	6	60	40

A comparison between 1½ in. hose couplings with gravity traps and 1½ in. hose couplings without gravity traps as to their steam obstructing qualities. This test was made on the 2 in. line with inlet valves closed.

In deciding upon locations of steam, air brake and signal connections it was found impracticable to establish fixed positions for these parts that could be adopted by all roads. Platform and draft gear designs not being alike on all roads renders the subject a very difficult one to treat. It was therefore deemed best to establish positions for steam heat, signal and air brake only, with relation to each other horizontally, and back from inside face of knuckle, to which all or nearly all can adhere. Then within certain limits, the air brake and steam heat pipes can be adjusted vertically or all the pipes can be shifted horizontally, providing their relative locations are maintained. This method provides sufficient flexibility to permit of the proposed locations being followed on any design of platform and when so arranged the connections will hang properly when coupled together.

Tests B and B-1.—2-in. vs. 1½-in. Train Line. Temperature Test.

Test B: 1½-in. Line; 1-in. Inlets

No. of car	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Av.
Degree rise per minute	.40	.33	.33	.40	.34	.36	.37	.32	.28	.25	.28	.21	.23	.24	.23	.40	.31
Pressure drop per cent	6.1	30	42	48	54	60	73	78	85	93	95	91	90	80	86	75	68
Outside temperature, deg	..	..	..	..	..	..	..	38	..	..	..	..	..	..	..	..	..
Initial pressure, lbs	..	..	..	..	..	..	..	80	..	..	..	..	..	..	..	..	..

Test B-1: 2-in. Line; 1-in. Inlets.

No. of car	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Av.
Degree rise per minute	.40	.50	.50	.66	.50	.50	.44	.50	.50	.50	.50	.50	.50	.60	.60	.60	.51
Pressure drop per cent	8	50	51	35	33	42	47.5	42	42	50	47	50	40	33	36	36	40
Outside temperature, deg	..	..	..	..	..	..	..	40	..	..	..	..	..	..	..	..	..
Initial pressure, lbs	..	..	..	..	..	..	..	80	..	..	..	..	..	..	..	..	..

Tests C and C-1.—2-in. vs. 1½-in. Train Line Temperature Test.

Test C: 1½-in. Line; ¼-in. Inlets.

No. of car	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Av.
Degree rise per minute	.40	.31	.32	.38	.36	.36	.36	.31	.29	.23	.25	.20	.24	.24	.23	.38	.305
Pressure drop per cent	10	30	30	34	50	53	64	70	78	83	83	80	76	70	75	70	59
Outside temperature, deg	..	..	..	..	..	..	..	37	..	..	..	..	..	..	..	..	..
Initial pressure, lbs	..	..	..	..	..	..	..	80	..	..	..	..	..	..	..	..	..

Test C-1: 2-in. Line; ¼-in. Inlets.

No. of car	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Av.
Degree rise per minute	.43	.50	.51	.59	.51	.51	.51	.53	.47	.53	.57	.46	.51	.55	.57	.60	.52
Pressure drop per cent	25	35	37	30	31	36	36	33	40	35	30	24	24	22	22	30	31
Outside temperature, deg	..	..	..	..	..	..	..	40	..	..	..	..	..	..	..	..	..
Initial pressure, lbs	..	..	..	..	..	..	..	80	..	..	..	..	..	..	..	..	..

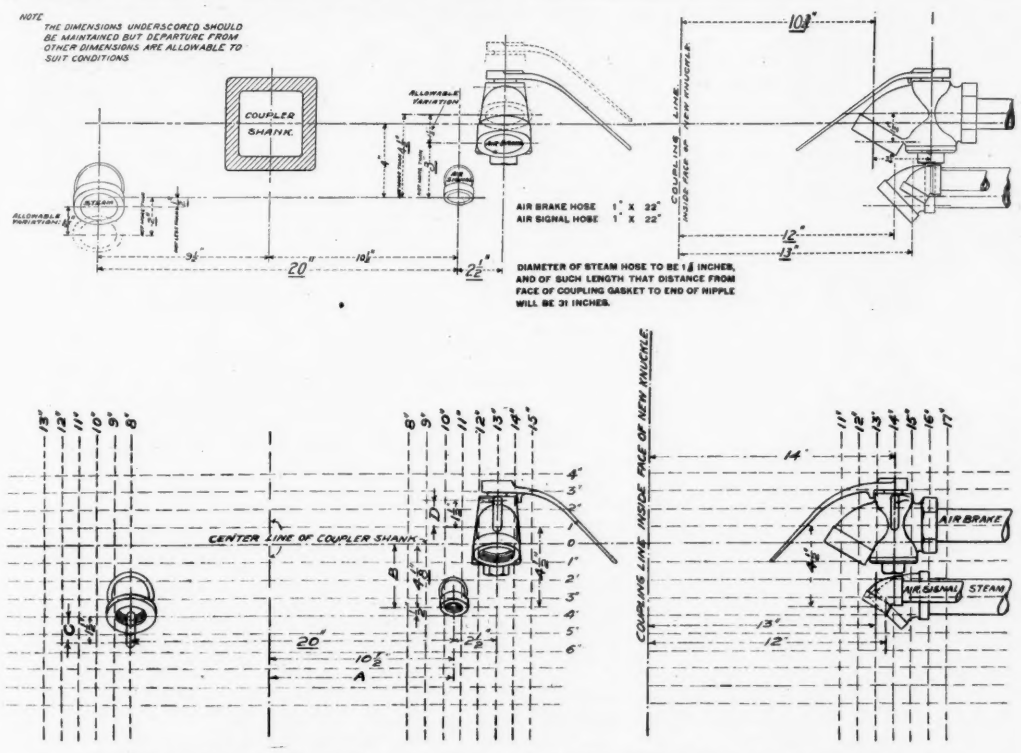
Tests E and E-1.—2-in. vs. 1½-in. Train Line. Temperature Test.

Test E: 2-in. Line; 30 lbs. Initial Pressure.

No. of car	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Av.
Degree rise per minute	.33	.33	.30	.45	.33	.33	.33	.33	.33	.33	.31	.31	.31	.33	.30	.37	33.3
Pressure drop per cent	3.3	33	33	20	20	25	50	50	60	67	67	66	56	46	46	53	45.3
Outside temperature, deg	..	..	..	..	..	..	40	..	..	..	..	..	..	..	..	..	..

Test E-1: 1½-in. Line; 80 lbs. Initial Pressure.

No. of car	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Av.
Degree rise per minute	.40	.31	.32	.33	.36	.36	.36	.31	.29	.23	.25	.20	.24	.24	.23	.38	30.5
Pressure drop per cent	10	30	30	34	50	53	64	70	78	83	83	80	76	70	75	70	59
Outside temperature, deg	..	..	..	..	..	..	..	37	..	..	..	..	..	..	..	..	..



Proposed Location for Steam Heat, Air-Brake and Air Signal Pipes at End of Passenger Cars.

NOTE.—Preferred location shown for air signal elbow—The location of air-brake angle cock and steam heat elbow to be relative to this as shown by dimensions.

The committee would recommend for adoption as recommended practice the following:

Two-inch steam train pipe; end train pipe valves; steam hose, 1⅝ in. inside diameter and of such length as to provide 31 in. from face of coupling gasket to end of hose nipple; 1½ in. steam hose couplings with gaskets having 1½ in. diameter opening, gaskets to be so constructed that the normal diameter of opening will always be maintained; couplings not provided with gravity traps; inlet valves to have reduced openings which should be as small as possible and maintain the volume of steam required by the radiating pipes for the severest weather conditions, steam heat, air brake and signal connections to be located as shown on diagram; air brake and air signal hose to be 1 in. diameter and 22 in. long.

The report is signed by Messrs. H. F. Ball, Chairman; T. W. Demarest, J. T. Chamberlain.

REPORT OF THE ARBITRATION COMMITTEE.

During the fiscal year just closed the committee has arbitrated 16 cases, Nos. 639 to 654, inclusive. These decisions have been printed and distributed to the members as rendered.

The question of repairs of and detail prices for repairs of steel cars, as well as prices for steel cars destroyed, has been carefully considered by the committee, and an effort made to obtain prices for these items, but the information obtained was so meager that it was thought best not to suggest any prices. The committee would recommend that a special committee, composed of members who have handled steel cars in large numbers, be appointed to consider the matter, and present at the next convention a schedule of prices, not only for labor and material for repairs of steel cars, but also prices for such cars when destroyed.

The New York Railroad Club recommends that the per diem rules, as framed by the American Railway Association, be added as an appendix to these rules. As it is thought this would be a great convenience to our members, the committee concurs in the suggestion. The report includes in detail suggestions for changes in the Rules of Interchange, with the committee's recommendations. It is signed by Mr. Joseph W. Taylor, Secretary to the committee.

LABORATORY TESTS OF BRAKE-SHOES.

The report of this committee covers the tests made at Purdue University during 1902-1903 of four shoes submitted by the Michigan Central and the Chicago, Burlington & Quincy. Three of these shoes tested for the Michigan Central were cast-iron shoes without inserts. The fourth was a Walsh shoe which had pear-shaped inserts of hard metal in a body of soft cast-iron. The results of the tests are given in graphical and tabulated form. The plain cast-iron shoes developed a coefficient of friction below the requirements of the standard specifications with a rise of the coefficient at the end of the stop, in excess of the limits allowed. The insert shoe had a coefficient of friction in excess of the specification and a rise of coefficient at the end of the stop within the limit for cast-iron wheel but exceeding the limit for the steel-tired wheel. The report is signed by Messrs. Charles Coller, Chairman; William Garstang, W. F. M. Goss.

The American Society of Mechanical Engineers' Convention.

The 47th meeting of the American Society of Mechanical Engineers was held at Saratoga Springs, N. Y., June 23 to June 26, inclusive. Up to the time of the first session over 300 members had registered and by the end of the session close to 1,000 had registered.

The welcoming address on behalf of Saratoga was made by Mr. A. L. Rohrer, of the General Electric Company. President Dodge responded to the address and referred, among other things, to the gift of Mr. Carnegie to the

engineering profession, and said that it will be necessary to look far into the future in order to provide adequate facilities in the new building. The following resolutions presented by Mr. F. J. Miller were adopted:

"Be it Resolved, That this society desires to place on record its appreciation of the purpose of Mr. Carnegie, in seeking to advance by this means the interests of the profession of engineering;

"Resolved, That by embodying this purpose in the form of a great and noble building for the uses of those organizations whose aims are to foster the development of engineering, the donor has taken a step which will notably advance those interests;

"Resolved, That the society approves the prompt response of its Council to the opportunity offered to favor and further the interests of the society which are involved in that progress of the profession which lies at the base of the Carnegie gift;

"Resolved, That it be referred to the council with power to transmit by cablegram and letter to Mr. Carnegie the action of the Society, and to carry out by further action the details necessary to realize Mr. Carnegie's generous purpose."

The discussion on the metric system was again taken up and a table was shown giving the result of the letter ballot. But 566 votes were cast on the question of the adoption of the metric system as the only legal standard, of which number 363 were against the metric system. One hundred and fifty-three votes were cast in favor of legislation to promote the adoption of the metric system and 311 votes were cast against legislation to promote adoption of the metric system. Mr. Henning opposed serious consideration of this ballot because but 20 per cent. of the total membership had voted, but Mr. F. A. Halsey replied to this by saying that inasmuch as the ballot had been open to all members it was fair to assume that those interested in the subject had voted and that, therefore, the result of the ballot represented the sentiment of the society.

The committee on revision of by-laws reported, and it was finally decided to print the new constitution and put its adoption to letter ballot prior to the December meeting, after the same had been circulated among the members. The fifth session of the society was held at Schenectady. A special train of the Delaware & Hudson took the members to the Schenectady plant of the American Locomotive Company at 10.30 a.m., and the party was escorted by officials of the company about the new buildings. After luncheon a meeting was held in Union College chapel. At the conclusion of the business session the members present went to the General Electric Company's works and were shown through the shops. The sixth and last session was held in the ball room of the United States Hotel, and in closing the convention adopted a set of resolutions expressing thanks to the various concerns and persons who had assisted in making the convention a success.

TECHNICAL.

Manufacturing and Business.

The Ayer & Lord Tie Company, Chicago, Ill., will increase its capital stock from $500,000 to $1,500,000.

Booth & Flinn, Ltd., contractors of Pittsburg, have two Little Giant steam shovels in good condition for sale.

The Keystone Drop Forge Works has begun work at its new shops at Chester, Pa. The old shops in Philadelphia will be abandoned.

The Allis-Chalmers Company has removed its New York City offices from the Broad Exchange Building to the Empire Building, 71 Broadway.

The Sherwin-Williams (Paint) Co. has increased its capital stock by $1,000,000, making the total $3,500,000. The new stock is 7 per cent. preferred.

The "Cortez," a private car for the Mexican Government, has just been sent to the City of Mexico by the Harlan & Hollingsworth Company of Wilmington, Del.

The W. H. Crumb & Company, doing a general construction business such as building railroads, power plants, etc., has incorporated under the laws of New Jersey, with $100,000 capital.

The Nye Construction Company has been incorporated in New Jersey with $100,000 capital by Joseph F. Cotter, Geo. H. B. Martin and G. W. Grand, to build railroads, bridges, docks, etc.

The forge department and the bar mill of the Southern Car & Foundry Co. at Anniston, Ala., destroyed by fire some time ago, have been rebuilt and the new shops were put in operation last week.

The Southern Railway Supply & Machine Co. has applied for incorporation under the laws of Georgia, with $10,000 capital. The incorporators are P. J. O'Connor, M. A. O'Byrne and John E. Schwarz.

Joseph D. Harris, lately Assistant to the General Superintendent of Motive Power of the Baltimore & Ohio, has been appointed Assistant Chief Engineer of the Westinghouse Air-Brake Company.

The Automatic Car Brake & Railroad Supply Co., with office at 186 Newark avenue, Jersey City, has been incorporated in New Jersey, with $250,000 capital, by Geo. F. Brandon, C. Brown and A. C. Bagg.

The American Blower Co. has on its books orders for heating apparatus for the Baltimore & Ohio roundhouse at Keyser, W. Va., and induced draft apparatus for the Chicago, Burlington & Quincy at Aurora, Ill.

The National Car Line Co. has been incorporated in New Jersey, with $100,000 capital, by Louis B. Dailey, Kenneth K. McLaren and Joseph M. Mitchell, to make refrigerator cars and operate a refrigerator car line.

Edwin C. Potter has been appointed receiver for the United States Locomotive Corporation, and for Torbert & Peckham, Chicago, which business was succeeded by the United States Locomotive Corporation six months ago.

The 126 new passenger coaches now being put into service on the New York Central & Hudson River are equipped with Hale & Kilburn's new pressed-steel frame "Walkover" car seats, which have high backs and ticket holders.

The Peoria Car Co. is reported incorporated, with $1,000,000 capital, by Alexander Hoyt, V. H. Burke and A. L. Jacobs, of Cleveland, Ohio. Works at Peoria, Ill., are now being equipped, to build cars for both steam and electric railroads.

The Gould Coupler Company and the Gould Storage Battery Company, formerly doing business under the laws of West Virginia, have been incorporated in the State of New York with $5,000,000 capital. The organization remains the same.

The Davies Wheel Co. has been incorporated in West Virginia, with $100,000 capital, by C. F. Stanford, A. S. List, John M. Birch, M. L. Ott, Geo. A. Laughlin, A. S. Francis and W. W. Smith. The plant will be located at Moundsville, W. Va.

The Central Railroad of New Jersey has put into service its new steamboat "Asbury Park," built by William Cramp & Sons. The boat will run between the foot of Rector street, New York City, and Atlantic Highlands, N. J., and will have an average speed of 20 knots.

At a meeting of the stockholders of the New York Air-Brake Company last week the following were elected directors: Daniel Magone, Anthony N. Brady, Henry A. Rogers, Jay C. Young, Frederick S. Flower, Thomas C. Purdy, George B. Massey, Charles A. Starbuck and John C. Thompson.

The Pittsburg Piping & Equipment Co., with office in the Westinghouse Bldg., Pittsburg, has been organized by Geo. H. Danner, Chas. R. Rall and J. K. Smith, to do a general pipe fitting, pipe bending and machine shop business at works located at Thirty-fifth and Smallman streets, Pittsburg. The company will also make bronze castings.

The Holland Company of Chicago, makers of the Martin metallic flexible joint and Holland journal box, have removed their San Francisco office from No. 508 Market street to No. 12 Fremont street. Mr. J. C. Martin, Jr., Vice-President of the company, will be manager of the San Francisco branch, with Mr. S. P. Russell, Jr., Assistant Manager.

At the annual meeting of the stockholders of the American Car & Foundry Company the retiring board of directors was re-elected. The report for the year ended April 30, 1903, shows net earnings of $7,059,902, as against $4,295,602 for the previous fiscal year, and a surplus for the year, after payment of dividends on the preferred and common stocks, of $4,059,902 as against a surplus of $1,595,602 for the previous year.

The Union Switch & Signal Company will issue at once 10,000 shares ($500,000) of new common stock of the par value of $50 a share. This will be offered to the present stockholders at $70 a share, or 40 per cent. premium. The recent transactions in the common stock have been at prices between $86 and $90 a share. The stockholders have the right to subscribe for the new issue to the amount of one-third of their present holdings.

In addition to a large number of contracts for municipal bridges in the southeastern States, the Carolina Steel Bridge & Construction Co. of Burlington, N. C., has a contract with the St. Louis & San Francisco R. R. for about $375,000 worth of steel bridge work. It also has a contract for the steel work for the Fort Smith (Ark.) postoffice building, and for the roof trusses of the Southern Railway's shop buildings at Atlanta, Ga.; a three-span drawbridge for the Danville & Western at Lake Charles, and a number of bridges for contractors in Texas.

At the meeting of the directors of the American Locomotive Company, held June 24, the regular quarterly dividend of 1¾ per cent. on the preferred stock was declared. The President's statement shows gross earnings for 12 months ended June 30 (with the month of June partly estimated) of $32,863,730, an increase over the previous fiscal year of $6,465,337. More than $4,000,000 has been spent in enlarging the plants and introducing modern machinery. Improvements already made have increased the output 40 per cent. The improvements authorized will be completed during the next fiscal year.

The Continental Railway Equipment Company has been incorporated in New Jersey with a nominal capital, later to be increased to $8,250,000. It has acquired the Commercial Railway Equipment Company; also the Compressed Air Company, under the terms of an agreement with the Corporation Trust Co., 135 Broadway, New York. A. H. Keith is Secretary of the Continental Railway Equipment Co. The Commercial Railway Equipment Co. has a plant at Manchester, Va., and deals in all kinds of railroad cars, locomotives, rails, spikes, wire cable, stone crushers, road rollers, etc. The New York office is 120 Liberty street.

Messrs. Pawling & Harnischfeger, of Milwaukee, makers of cranes, report orders during the past month as follows: Pittsburg & Montana Copper Co., Butte, Mont.; Chapman Valve Mfg. Co., Indian Orchard, Mass.; Pratt & Letchworth Co., Buffalo; the New York Edison Co., New York City; Metropolitan Street Railway Co., Kansas City, two specials; the A. & F. Brown Co., Elizabethport, N. J.; Standard Oil Co. of New York, Atlas Works, Buffalo, two cranes; the Kelly & Jones Co., Greensburg, Pa., two cranes; the Standard Steel Works, Burnham, Pa.; Allis-Chalmers Co., Gates Works, Chicago; the Edward Ford Plate Glass Co., Toledo; the Ingersoll-Sergeant Drill Co., Easton, Pa., four wall cranes and one double extension crane; Lobdell Car Wheel Co., Wilmington, Del.; Atlantic, Gulf & Pacific Co., San Francisco; Gisholt Machine Co., Madison, Wis.; Singer Mfg. Co., Elizabethport, N. J.; S. M. Jones Co., Toledo, two cranes, and the McConway & Torley Co., Pittsburg. They intend making extensive improvements and build an entire new plant, which will be located on National avenue, near the city limits.

Iron and Steel.

The South Chicago plant of the Illinois Steel Co., according to a despatch on June 26, turned out 1,894 tons of rails in one day. The best previous record was 1,772 tons.

The stockholders of the Wm. Cramp & Sons Ship & Engine Bldg. Co. have authorized an increase of the capital stock by $1,250,000, and of the funded debt from $1,800,000 to $7,500,000.

The Union Forge Co. has been organized in Pittsburg by J. B. Marshall, of the McClintic-Marshall Construction Co., and others, to make rivets, bolts and forgings. Shops are now being equipped and will be ready by October.

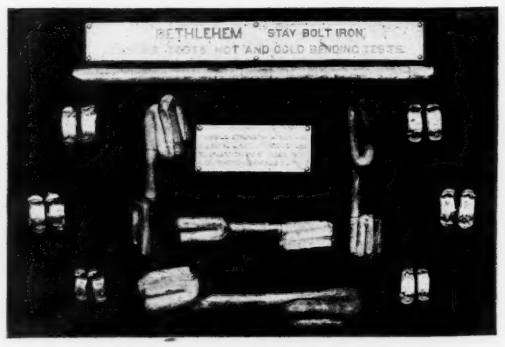
A long contest for control of the Colorado Fuel & Iron Company has come to an end. J. C. Osgood, John L. Jerome and A. C. Cass have resigned their executive positions, and J. H. McClement has been elected chairman of the board. F. T. Gates, John D. Rockefeller, Jr., and E. Parmelee Prentice have been elected directors to fill vacancies in the board, and Messrs. Gates and Rockefeller were elected to fill the vacancies on the executive committee. Mr. Gates is known as a Rockefeller representative, Mr. Prentice is a son-in-law of John D. Rockefeller, and Messrs. Rockefeller, Prentice and Gates are directors of the Missouri Pacific Railway; so that the C. F. & I. is now controlled by the Gould-Rockefeller interest.

South Baltimore Steel Car & Foundry Co.

The consolidation of the South Baltimore Car Works, the South Baltimore Foundry and the Ryan & McDonald Mfg. Co. will be known as the South Baltimore Steel Car & Foundry Co., and it will have a capital of $1,000,000. The three plants, which are on Curtis Bay, in South Baltimore, have been practically owned by the same interests; and they now propose to build shops to make steel cars. The officers of the new company are: President, Charles T. Crane; Chairman of the Board, Howard Carlton; Vice-President, J. Edward Harvey; Treasurer, Carter G. Osburn; Secretary, H. Milton Luzius; General Manager, John H. Farlow.

"Bethlehem" Staybolt Iron.

The accompanying illustration is from a photograph of the exhibit of the Bethlehem Steel Company at Saratoga, and shows one of their recent specialties—a high grade staybolt iron. The puddling furnaces, especially designed by them to make a low phosphorus muck bar as



a substitute for Swedish iron in their ordnance mixture, have also been found advantageous in making a high grade muck bar puddled from "Bethlehem" machine cast pig iron. By a special method of piling and refining this muck bar, they have produced a tough, ductile, strong and fibrous staybolt iron free from cinder and capable of meeting the severest tests, as evidenced by the accompanying cut.

Taylor Interlocking in Germany.

An electric interlocking plant, made by the Taylor Signal Company, of Buffalo, N. Y., has lately been put in at Petange, in the Grand Duchy of Luxemburg on the Prince Henry Railroad, and a description of the plant is given in a recent number of the *Revue Generale des Chemins de Fer*. The account shows, as has been shown at many places in this country, that the cost of power for operating switches and signals by electric motors is ridiculously small. At Petange the average number of lever movements daily is 2,463, and for this amount of work the

power for a month has cost 18 francs 40 centimes, or less than $3.60 a month. This is the cost of making 73,890 movements; equal to less than 5 mills for each 100 movements. The price paid for the electric current is 4 centimes, or about 8 cents, per kilowatt hour. With gasoline engines, such as are used in this country for charging storage batteries for use at Taylor plants, the cost of fuel has been as low as 3.5 cents per kilowatt hour.

Non-Corrosive Boiler and Condenser Tubes.

The Shelby Steel Tube Company's exhibit at the booth of the Bethlehem Steel Company at Saratoga is notable. These tubes are made of a high nickel steel in sizes from ⅝ in. to 4 in. in diameter. It is only recently that the process of manufacture has been perfected in this country, although nickel steel tubes have been used with success in the German, French and Dutch navies. The increased initial cost of these tubes is said to be offset by the following advantages: 1.—Non-corrosive tube, thus avoiding the "pitting" of iron and low carbon steel tubes.

Non-Corrosive Nickel-Steel Tubes.

2.—Increased strength over iron and steel tubes, thus allowing, without risk, the use of a tube of lighter gage. 3.—High scrap value. These tubes can be sold at the market price of steel tube scrap, plus about 20 cents per pound for the contained nickel. The illustration shows the results of some tests made by the U. S. Navy authorities, who are to place some of these tubes in marine boilers. This high nickel steel can be welded so that the tubes can be "safe ended" when desired. They can also be "beaded," and it is claimed that a tight joint can be got owing to the toughness and high tensile strength of the metal.

New Spring and Axle Works.

The Liggett Spring & Axle Co., now at Allegheny City, Pa., and building new works near Monongahela, on the Pittsburgh & Lake Erie, expects to have the new plant in operation by Sept. 1. The annual capacity of the new works will be about 800,000 steel axles, in addition to the steel springs which will be made. The present plant at Allegheny will be abandoned. The site of the new works, it is said, will be known as Axleton.

Grade Crossings in New York City.

Mayor Low, of New York City, has announced the appointment of the commission which is to supervise the work of removing the grade crossings of the Long Island Railroad and the Brooklyn Rapid Transit Company in Brooklyn Borough. The commission is as follows: Louis M. Beer, Frank M. Brooks, Edwin C. Swezey, William F. Potter, General Superintendent of the Long Island Railroad, and John C. Brackenridge, Chief Engineer of the Brooklyn Rapid Transit Company. The commission will probably organize at once. Over 60 grade crossings will be changed at a cost of about $9,000,000. A note concerning this extensive improvement was published in the *Railroad Gazette* of May 1, 1903.

New Bridges in Massachusetts.

The bridge legislation in Massachusetts during the session just closed included a bill authorizing the Essex County Commissioners to build a bridge over the Danvers River between Salem and Beverly. The cost is limited to $100,000, 60 per cent. to be borne by the county, the remainder to be assessed upon the places benefited, with the exception of 10 per cent., which may be assessed upon any street railroad which obtains a location over the bridge.

The County Commissioners of Essex were also authorized to build a bridge over the Merrimack River in Haverhill at $2,000.

A bridge to be built by the Metropolitan Park Board was authorized over the Charles River between Newton and Wellesley, while a petition for a similar bridge between Newton and Weston was referred to the next General Court.

The largest scheme authorized by the Legislature provides for a dam to be surmounted by a bridge across the Charles River between Boston and Cambridge, at an expense of several millions of dollars.

A bridge was also authorized to be built by the cities of Boston and Chelsea with a draw across Chelsea Creek in that part of Boston known as Orient Heights.

A bill was reported to provide for a bridge over the North River between Pembroke and Hanover, to be built by the Plymouth County Commissioners, the expense not to exceed $20,000.

Another bill passed provides for a State highway between Commercial street in Lynn and the Saugus River, thus making possible the building of the Metropolitan Park bridge across the river from Revere Beach. This bridge has been authorized for many years and an appropriation of $100,000 has been in the hands of the Park Commissioners. It is understood that work will be begun at once.

THE SCRAP HEAP.

Notes.

After July 1 no pay cars will be run on the Pacific system of the Southern Pacific Company. Employees will be paid in checks drawn by the auditor on the treasurer, whose office is in San Francisco.

Railroad Young Men's Christian Associations, according to a report presented at the recent triennial conference in Topeka, have increased during the past three years from 161 to 195; and the membership from 41,794 to 62,228.

The New York, New Haven & Hartford announces that local freight rates will be at once increased throughout the company's lines. Newspaper accounts say that the advances will, in most cases, be from one cent to two cents per 100 lbs. The president of the road, in an interview, says that coal for locomotives is now costing two millions a year more than formerly; that new cars cost 65 per cent. more than three years ago and locomotives 40 per cent. more. The increases in wages which were granted two months ago will add a million dollars a year to the payroll.

Most or all of the trains of the Pennsylvania Railroad which run between New York and Washington without entering Broad Street Station, in Philadelphia, now make two stops in that city; one at Germantown Junction and the other at West Philadelphia. The additional stop appears to have been ordered in consequence of the fears of some of the people of Philadelphia that they were being "side-tracked." For the accommodation of passengers who hitherto have traveled from Philadelphia to New York on the Washington train leaving Philadelphia at 1 o'clock, a new train has been put on, starting ahead of the Washington train.

On Thursday, June 18, representatives of the technical papers visited the shops of the General Electric Company at Schenectady. The party went to Schenectady by invitation of the General Electric Company and a special car was provided for the purpose. Mr. E. H. Mullin represented the company. Luncheon was served in the officers' dining room at the Schenectady Works, after which the party was taken through the shops and was permitted to view the special tools and machinery used in building the Curtis turbine. A new shop has been built for this purpose, about 800 ft. long and 90 ft. wide, and a contract has recently been let for a much larger building which will be completed by the first of the year. The largest turbine in process of erection was one for the Chicago Edison Company, of 5,000 k.w. capacity, while several 500 k.w. machines were on the testing floor. It is said that orders for more than one-quarter of a million h.p. are now booked. The principle of the machine was illustrated and described in the *Railroad Gazette* April 17, 1903, p. 285.

At a hearing before the Interstate Commerce Commission at Chicago the other day representatives of the Atchison "took a prominent part" in trying to prove that the Union Pacific had paid rebates to Peavey & Company. This is the story as it comes from the Chicago reporters, who are trying to make out that the railroad traffic officers of the West are beginning to "tell on each other," as it was predicted they would do after the abolition of the law prescribing imprisonment as a penalty for making unlawful rates. Whether or not there is any real basis for this fancy of the reporters cannot be determined from the meager facts that they give. The alleged rebates were in the shape of payments for elevator service at Council Bluffs and at Kansas City. The most direct evidence that the accuser of the Union Pacific is a railroad company, or a railroad officer, is given in the statement that a Union Pacific man complained at "the practice of the commission in investigating charges against railroads in cases where the inquiry is based on secret information furnished by business competitors." In making answer to the Commission recently on this or a similar complaint, the Union Pacific asserted that the elevator service which was performed for the road by Peavey & Company was a necessary incident of transportation, and was paid for by the railroad at reasonable rates and on an impartial basis.

Telegraph and Telephone.

The New York Central has a simply arranged telephone circuit (fitted up by the American Bell Telephone Company) on a telegraph wire, between Mott Haven (5 miles out of New York) and Albany. The telegraph line has no way stations between the points named, and the wire is copper. Call bells are rung in the usual manner, special generators being used which are of high frequency, so as not to interfere with the working of the Morse telegraph. The New York Central now uses the Granel "telegraphone" on its Pennsylvania Division as well as on the R., W. & O. This system, which was lately tried on the Chicago, St. Paul, Minneapolis & Omaha, has been described in the *Railroad Gazette*. On the New York Central, work trains, wrecking trains and inspection engines used by officers, are supplied with telephones and carry "fish poles," by which connection can be made with an overhead line wire without climbing the telegraph pole. Low-capacity condensers are provided at intermediate telegraph stations to carry the telephone current around the Morse instruments; and anyone out on the road having occasion to use a telephone makes known his presence on the wire by sending a call which is received on the relay at the despatcher's office. There are no permanent ground wires, the ground connection being made only while the telephone is being used, and then the connection between the line wire and the ground is made through a condenser and not by contact. Mr. Taylor, Superintendent of Telegraph of the New York Central, who tells these facts in the *Telegraph Age*, says that the American Bell Telephone Company is now prepared to furnish for railroad companies any kind of composite circuit that may be desired.

A Fine Freight Run.

On Wednesday, June 17, a freight train of 78 loaded cars was run over the Middle Division of the Pennsylvania Railroad from Altoona to Harrisburg, 132 miles, in 6 hours and 30 minutes [20.3 miles an hour]. This is unprecedented time for a train of the size and weight, though better time has been made over the same division by trains of 30 cars. The train left Altoona at 2.30 p.m. and rolled into the Harrisburg yards at 9 o'clock. Once the train was brought to a stop to refill the engine's tank with water and renew the coal supply.

Disastrous Train Wreck in Spain.

Press despatches of June 28 report more than 100 persons, possibly 170, killed by the wreck of a passenger train on the Bilbao-Saragossa Railroad, in Spain. The second of two engines drawing the train, which consisted of 16 coaches, was derailed while crossing a bridge over Nejevilla River and the entire train fell 50 ft. to the stream below. Of 300 passengers on the train only six escaped unhurt. The accounts contain no hint as to the cause of the derailment except the statement that before the derailment the leading engine broke away from the other one.

A New Master Mechanics' Scholarship.

Through the generosity of Messrs. Jos. T. Ryerson & Son, Chicago, the Master Mechanics' Association will have one more scholarship at its disposal. This company agrees to give $600 a year for four years. The only restrictions are that the candidate must be a graduate of a high school, an employee in a shop under the jurisdiction of a member of the A. R. M. M. A., and in good health. The candidates may select the school they wish to attend. There will be no legal obligation on the part of the recipient of the scholarship to repay the money received, but it is understood that it will be considered a "debt of honor" and repaid if possible.

Exemption of Cars Used in Interstate Commerce.

Under the constitution of West Virginia, cars, engines and all other movable property of a railroad company or corporation are subject to process of attachment, where the attachment is applicable, as well as to ordinary execution. But the Supreme Court of Appeals of West Virginia holds (Wall vs. the Norfolk & Western, 44 S. E. Reporter, 294) that a railroad car sent loaded with freight from another State into West Virginia, and to be returned loaded to the former State in the transaction of interstate commerce, cannot be levied upon under an attachment in West Virginia; nor will another railroad company having such cars in its possession in the process of carrying on interstate commerce be liable to garnishment by reason of its possession received from another company against which an attachment was issued.

Pennsylvania R. R. Terminal at Long Island City.

Many of the details of the new terminal and yards of the Pennsylvania R. R. at Long Island City have not yet been definitely determined, but an idea of their size and appointments may be derived from recent remarks of one of the lawyers of the company. There will be no station at Long Island City proper, as the franchise of the Pennsylvania R. R. specifies that there shall be no terminal within five miles of Broadway and 34th street, Manhattan. The mouth of the Pennsylvania East River tunnel will be located about 1½ miles east of Long Island City, just west of Thompson avenue. The yards will be located on the south side of the main tracks of the Long Island R. R., and will be about one mile long. These yards will intercept several streets which will be carried across the tracks on overhead bridges. The eastern end will be not far from Woodside, and it is here that the terminal will be built. In connection with the yards, a large freight station is projected for handling the freight traffic from the yards at Bay Ridge. The Pennsylvania has acquired nearly or quite all the land necessary for yard and terminal purposes.

Remedy for Keys Left Open.

"C. K. Jones's automatic telegraph circuit protector and signaling machine," which was shown at the recent annual convention of the Railroad Telegraph Superintendents, and which was briefly mentioned in the *Railroad Gazette* at that time, is described in the last number of the *Telegraph Age*. It is an arrangement of an electro magnet, with circuit closers, on the back of a clock, in such a way that whenever the telegraph line to which the apparatus is attached is left open for a given time, say two minutes, the key, at the office where the "protector" is situated, will be cut out of the circuit and the ground wire will be disconnected. Mr. Jones's plan is to provide one of his devices at each telegraph office on a line. If the operator carelessly leaves his key open for two minutes, or if he should leave the ground wire connected for that length of time, a circuit closer, fixed to the minute hand of the clock, which has been put in operation automatically, and has been moving from the time that the key was opened, will, at the end of the two minutes, switch the local circuit off from its normal course through the sounder and through an electro magnet in the clock, and turn it through another electro magnet, which, on being closed, performs three functions; it

bridges the main line around the open key, it cuts off the ground wire, and it sets ringing an alarm bell calling the attention of the operator. By the use of this alarm bell the despatcher, or, in fact, any office on the wire, can at any time, by holding the circuit open two minutes, call every station on the line. With bells made loud enough and suitably situated, operators could thus be brought on duty when asleep or when distant from the office. The inventor of this device is Mr. C. K. Jones, of Tuscumbia, Ala.

Electrification in England.

The British Westinghouse Company has secured the contract for changing the Wirral Railroad (England) from a steam to an electric line. The road is 15 miles long, extending from West Kirby to New Britain, and connects Liverpool, by means of the Mersey Tunnel R. R., with the Cheshire Peninsula. Power will be taken from the Mersey R. R. generating station. The three-phase current will be supplied by double current generators, and raised by static transformers to a high pressure for transmission to sub-stations on the Wirral Line.

London to Carlisle Without a Stop.

Press despatches of June 19 report that a special train of the London & North Western has run from London to Carlisle, 299.25 miles, in 5 hrs. 58 min. without stopping. The report says that this is the world's record. In distance traversed without a stop this statement is undoubtedly correct; but in speed this performance is considerably below what has been done before over the same route, and also over the Lake Shore & Michigan Southern, where, on October 24, 1895, a special train was run 510.1 miles in 8 hrs. 1 min. 7 sec., or at the rate of 63.61 miles an hour.

American Electric Locomotive for South African Diamond Mines.

The steamship "Roseley" which recently left New York for South African ports, took out what will probably be the first electric locomotive to enter the "Dark Continent." The locomotive, which was made by the C. W. Hunt Co. of West Brighton, N. Y., is shipped to the order of the De Beers Consolidated Mines, Ltd., for use on one of their mining plants. It is of the storage battery type, standard throughout, with the exception of the gage of the wheels, which is special, to suit the track now in use at the mines.

Six Months Railroad Building in Texas.

The Railroad Commission of Texas gives the following approximate estimate of railroad mileage built in Texas during six months, ended June 30, 1903:

	Miles.
Chicago, Rock Island & Gulf—Ft. Worth to Dallas...	32.0
Dallas Terminal—In Dallas	0.5
Ft. Worth & Rio Grande—Colorado River to Brady...	28.2
Gulf, Beaumont & Gt. North'n—San Augustine north.	5.0
International & Gt. Northern—Madisonville Branch..	30.0
Missouri, Kansas & Texas—Granger to Georgetown..	14.9
N. Y., Texas & Mexican—Bay City to Tres Palacios..	32.5
Oklahoma City & Texas—Red River to Quanah.....	8.7
St. Louis Southwestern—Dallas Branch.....	0.7
Tex. & New Orleans—Between Jacksonville and Mahl.	26.0
Texas & New Orleans—Nome to Sour Lake Springs...	8.2
Trinity & Brazos Valley—Hillsboro south.....	2.0
Timpson & Northwestern.....	2.0
Total	190.7

The approximate mileage built during the first six months of 1901 was 294; the first six months of 1902, 284.

Dining Car Difficulties.

The Boston & Albany, after a two months' trial of serving meals in dining cars by the card, at a loss of $900 a month, has decided to go back to the table d'hote plan. Vice-President Van Etten said: "We have gone back to table d'hote meals for two reasons: First, they paid better, and, secondly, in response to numerous requests from patrons of the road. Our dining car service is unprofitable at best, and the same thing is true of every railroad in the United States, with possibly the New York, New Haven & Hartford excepted. The item for help alone on each car is $14.75 daily, to say nothing of the wear and tear of the equipment, interest on the investment and the cost of hauling these heavy cars. One point of complaint against a la carte service is the length of time it takes to get an order ready. Recently we had 79 passengers on one of our western trains who wanted service in the dining car and it took five hours before all were helped. If we had been running a table d'hote it would not have taken one-quarter of this time, as everything is prepared ahead, while in the latter case all orders must be specially prepared, and you know our facilities are quite limited. Then, again, in serving a la carte meals we have only canned vegetables, as we have not the space to load up with all the fresh variations, and even if we did it would be a matter of speculation to know how much of each and the variety to keep in store. If we pay the expense of maintaining this branch of the business we think we are doing pretty well."—*Boston Herald.*

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

International Association of Municipal Electricians.

Several interesting features are promised for the forthcoming convention of the International Association of Municipal Electricians, at Atlantic City in September. Among them are an exhibit of the Cooper-Hewitt mercury vapor lamp and converter, which have lately been perfected, and a demonstration of the DeForest system of wireless telegraphy. Walter M. Petty, Chairman Executive Committee, Rutherford, N. J.

Master Car and Locomotive Painters' Association.

The thirty-fourth annual convention of the Master Car and Locomotive Painters' Association will be held at Chicago, Ill., Sept. 8, 9, 10 and 11. Headquartes to be at the Victoria Hotel. Robert McKeon, Secretary, Kent, Ohio.

Freight Claim Association.

The twelfth annual meeting of the Freight Claim Association was held at Detroit, June 17, about 100 members being present. President J. J. Hooper, of the Southern Railway, presided. The membership of this association is now 221. The following officers were elected: President, H. C. Barlow, Erie Railroad, New York; Vice-Presidents, A. E. Rosevear, Grand Trunk; Otto Kirkland, Illinois Central Railroad; Secretary, W. P. Taylor, R. F. & P. R. R., Richmond, Va. The next convention will be held in Savannah, Ga., in May, 1904.

National Association of Railroad Commissioners.

In accordance with the vote at the fourteenth annual convention of the National Association of Railroad Commissioners, held at Charleston, in February, 1902, the fifteenth annual convention of that Association is now announced to be held in Portland, Me., on Tuesday, July 14. The membership of this body embraces the Interstate Commerce Commissioners, the Railway Commissioners or Deputy Commissioners of the several States and Territories of the Union, and in those States and Territories having no railroad commissions, State officers who by law exercise active supervisory powers over the affairs of railroads; also the Secretary and Assistant Secretary of the Interstate Commerce Commission, and the Secretary or Clerk of each State Railway Commission where such office is created by law. Honorary membership includes former members of the association, a committee of three from each Steam or Street Railway Accounting Association, the Statistician of the Interstate Commerce Commission and of the several State Commissions, together with the Engineers of said Commissions.

Committees have been appointed to report on: 1. Classification of Operating and Construction Expenses of Electric Railways; 2. Grade Crossings; 3. Railroad Taxes and Plans for Ascertaining Fair Valuations of Railroad Property; 4. Classification of Operating and Construction Expenses of Steam Railways; 5. Uniform Classification and Simplification of Tariff Sheets; 6. Railroad Statistics; 7. Legislation; 8. Safety Appliances; 9. Delays Attendant Upon Enforcing Orders of Railway Commissions; 10. Rates and Rate Making; 11. Form of Reports of Electric Railways.

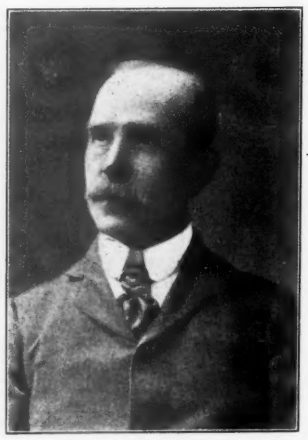
Each member is requested to come prepared not only to discuss these topics, but to present other matters pertaining to railroad regulation. The President is Hon. Benj. F. Chadbourne, of Maine, and the Secretary is Mr. Edward A. Moseley, Secretary of the Interstate Commerce Commission.

PERSONAL.

—Mr. George S. Morison, Past President of the American Society of Civil Engineers, died on Wednesday, July 1. Further notice of this distinguished engineer will appear in these columns next week.

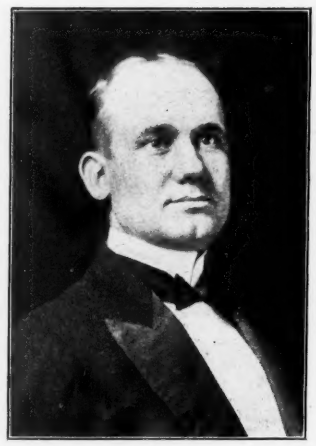
—Colonel George Church, of Great Barrington, Mass., died June 27, at the age of 77. He was one of the owners of the Richmond Iron Works Company, which furnished the government with material for guns and cannon in the 60's. Later he became interested in the Lenox iron furnace, at Lenox Furnace, Mass., and other iron concerns, including the Ramapo Iron Works at Hillburn, N. Y.

—Mr. William H. Lewis, the newly elected President of the American Railway Master Mechanics' Association and Superintendent of Motive Power of the Norfolk & Western, is 58 years old. He was born in Syracuse, N. Y., and entered railroad service in 1861 as a machinist apprentice for the New York Central & Hudson River. From 1864 to 1873 he was on the Chicago, Burlington & Quincy and its controlled line, the Hannibal & St. Joseph. Then for five years he was with the Northern Pacific as Master Mechanic, and from 1882 to 1884 held this position on the Oregon Short Line. In 1888 he went to the Chicago, Burlington & Northern, and was in the service of this company for nine years. He then went to the Norfolk & Western as Superintendent of Motive Power, which position he now holds.



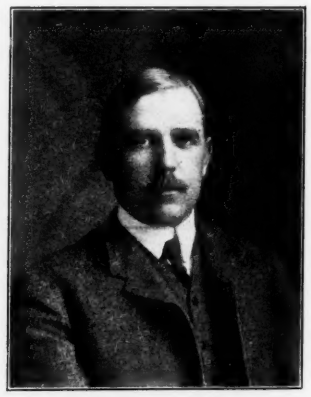
—Mr. Waldo H. Marshall, who has been appointed General Manager of the Lake Shore & Michigan Southern, has since February of last year been General Superintendent of the road. Mr. Marshall is about 39 years old. He was at one time on the editorial staff of the *Railway Review*. In 1897 he was appointed Assistant Superintendent of Motive Power on the Chicago & North Western, and resigned that position in 1899 to go to the Lake Shore as Superintendent of Motive Power.

—Mr. J. George Bloom, who goes from New Castle, Pa., to Topeka, Kan., as Principal Assistant Engineer of the Chicago, Rock Island & Pacific, has been Division Engineer of Maintenance of Way of the Baltimore & Ohio. Mr. Bloom was born in 1867 and was graduated from the Ohio State University as a civil engineer in 1889. His railroad service dates from that year, when he began as a rodman on the Pittsburgh, Cincinnati & St. Louis at Cincinnati. During the year 1890 Mr. Bloom was engaged in private work, but returned to railroading in 1891 as Assistant Supervisor and Assistant Division Engineer of the Norfolk & Western. Then for a time he was a draughtsman for the Baltimore & Ohio Southwestern, later becoming First Assistant Engineer. In 1895 he was Division Engineer of the Springfield Division, and in 1896 returned to Cincinnati as Principal Assistant Engineer.



—Mr. A. L. Langdon, the new General Freight Agent of the Long Island Railroad, began his railroad service as a clerk in the freight office of the Atlantic & Great Western at Corry, Pa., in 1863. He was a station agent for this company several years. In 1869 he was appointed agent of the Empire Line and remained with the line six years. In 1875 he was appointed General Freight Agent of the Cumberland Valley at Chambersburg, Pa., and in connection with these duties he was made General Eastern Agent of the Great Southern Despatch. He continued in this position until his appointment as General Freight Agent of the Long Island.

—Mr. A. H. Smith, who on the first of this month was promoted to be General Manager of the New York Central & Hudson River, has passed his whole railroad experience, except the last year, on the Lake Shore & Michigan Southern. Starting as a messenger in 1878 he was employed later as a clerk in the general office; and was transferred to the bridge construction gang as laborer in 1883. Five years later he was appointed foreman of bridges, and in the fall of 1889 was made Superintendent of the Grand Rapids Division of the Lake Shore & Michigan Southern. From then until he became Assistant General Superintendent Mr. Smith was Superintendent of various divisions. About two years ago he was made General Superintendent of the Lake Shore, which position he held up to the time of coming to New York as General Superintendent of the New York Central in 1902. Mr. Smith's most striking quality is his ability in dealing with men, in cultivating among his subordinates an enthusiasm for the road, in enforcing rigid discipline and in making a habit of cheerful obedience to rules. His earned promotions from messenger boy to general manager, all his life in the service of the same railroad system, are creditable to him, but to the company the example is invaluable as an assurance that merit alone is recognized.



ELECTIONS AND APPOINTMENTS.

Alabama Great Southern.—See Cincinnati, New Orleans & Texas Pacific.

Atchison, Topeka & Santa Fe.—G. R. Henderson, Superintendent of Motive Power, with headquarters at Topeka, Kan., has resigned, effective August 1.

Brunswick & Birmingham.—B. M. Robinson has been elected President.

Canadian Northern.—W. A. Brown, heretofore Superintendent of Winnipeg Terminals and lines West of Winnipeg, has been appointed Superintendent of Lines East of Winnipeg, with office at Port Arthur. J. W. Dawsey has been appointed Superintendent of Winnipeg Terminals and Lines West of Winnipeg, to succeed Mr. Brown.

Chesapeake & Ohio.—E. W. Grice has been appointed Superintendent of the Huntington Division, with head-

quarters at Hinton, W. Va., succeeding J. H. Carlisle, transferred, effective July 1.

Chicago, Rock Island & Pacific.—E. W. Thompson, Assistant General Passenger Agent, with office at Kansas City, Mo., has resigned.

Cincinnati, New Orleans & Texas Pacific.—W. H. Starr, Division Superintendent of the C., N. O. & T. P., at Somerset, Ky., has resigned. The position of General Superintendent of this road and the Alabama Great Southern, now filled by M. W. Maguire, has been abolished, and Mr. Maguire returns to his former position of Division Superintendent ot the C., N. O. & T. P., at Somerset, succeeding Mr. Starr.

Delaware, Lackawanna & Western.—J. W. McFarland has been appointed Assistant Master Mechanic, with office at Scranton, Pa.

Denver & Rio Grande.—S. H. Babcock, Assistant General Traffic Manager, with office at Salt Lake City, Utah, has resigned, effective July 1.

Erie.—George T. Depue has been appointed Master Mechanic, with headquarters at Hornellsville, succeeding Joseph Hamen, resigned, effective July 1.

Great Northern.—P. S. Dunn has been appointed Assistant Superintendent of the Breckenridge Division, with headquarters at Breckenridge, Minn., succeeding T. F. Lowry, assigned to other duties.

Indiana, Illinois & Iowa.—See Lake Shore & Michigan Southern.

Lake Erie, Alliance & Wheeling.—See Lake Shore & Michigan Southern.

Lake Erie & Western.—See Lake Shore & Michigan Southern.

Lake Shore & Michigan Southern.—W. H. Marshall has been appointed General Manager, with headquarters at Cleveland, Ohio, of this company and the Indiana, Illinois & Iowa and the Lake Erie & Western. H. S. Storrs, heretofore Assistant General Superintendent, has been appointed General Superintendent, with headquarters at Cleveland, of the L. S. & M. S., the I., I. & I., and the Lake Erie, Alliance & Wheeling, effective July 1. Mr. Storrs succeeds Mr. Marshall.

Little Kanawha.—H. G. Lampman, Secretary, Treasurer and Superintendent, with headquarters at Parkersburg, W. Va., has resigned.

Massachusetts Railroad Commission.—The successor of Mr. William A. Crafts, the veteran Clerk of the Board, who recently resigned, is Mr. Charles E. Mann, a journalist of long experience.

Missouri, Kansas & Texas.—J. W. Maxwell, heretofore General Superintendent at Dallas, Texas, of the Missouri, Kansas & Texas Railway of Texas, has been appointed Assistant General Manager of the entire system, with headquarters at St. Louis. E. M. Alvord, heretofore Division Superintendent at Parsons, Kan., has been appointed to succeed Mr. Maxwell at Dallas.

Missouri, Kansas & Texas of Texas.—See Missouri, Kansas & Texas.

Montpelier & Wells River.—John Whalen has been appointed Master Mechanic, with headquarters at Montpelier, Vt., succeeding G. Jacobson, deceased.

New York Central & Hudson River.—A. H. Smith has been appointed General Manager, with headquarters at New York. J. P. Bradfield, heretofore Assistant General Superintendent, has been appointed General Superintendent, with headquarters at New York, succeeding Mr. Smith, effective July 1.

Northern Pacific.—T. J. Delamere, Superintendent of Car Service, with office at St. Paul, Minn., has resigned.

Oregon Short Line.—The Montana Division of the O. S. L. and what will remain of the Salt Lake Division after the southern trackage of the road is transferred to the Salt Lake, are to be united, and G. H. Olmstead, who is now Superintendent of the former, will be made Superintendent of this entire division.

Pennsylvania.—E. D. Nelson has been appointed Engineer of Mechanical and Electrical Tests, with headquarters at Altoona. This is a newly created office. R. K. Reading, heretofore Master Mechanic at West Philadelphia, Pa., has been appointed Superintendent of Motive Power of the Philadelphia & Erie Railroad Division, with headquarters at Williamsport, Pa., succeeding Mr. Nelson.

Pennsylvania Company.—Otto Schroll, heretofore Superintendent at Richmond, Ind., of the Pittsburgh, Cincinnati, Chicago & St. Louis, has been appointed Superintendent, with headquarters at Toledo (North West System), succeeding W. H. Potter, resigned. W. B. Wood, heretofore Engineer Maintenance of Way (North West System), has been appointed to succeed Mr. Schroll at Richmond.

Rutland.—G. T. Jarvis, General Manager, has been elected Vice-President, also.

St. Louis & San Francisco.—R. V. Miller has been appointed Acting Superintendent at Fort Scott, Kan., succeeding H. S. Mitchell, who has been granted a few months leave of absence. H. F. Clark has been appointed Superintendent of the Kansas City Terminals, succeeding Mr. Miller.

Seaboard Air Line.—V. E. McBee, Fourth Vice-President, with office at Portsmouth, Va., has resigned, effective July 1.

D. E. Maxwell, Superintendent of the Sixth Division, with headquarters at Jacksonville, Fla., has resigned, and A. J. Connely, heretofore Assistant Superintendent of that Division, has been appointed to succeed him.

Southern.—Joseph Hainen has been appointed General Master Mechanic of the Eastern District, with office at Greensboro, N. C. Alexander Stewart has been appointed General Master Mechanic of the Western District, with office at Chattanooga, Tenn. The position of Assistant Mechanical Superintendent (formerly held by Mr. Michael), also those of Assistant Superintendent at Blacksburg, S. C., General Foreman of Car Repairs and General Engine Inspector, have been abolished. J. B. Michael has been appointed Master Mechanic of the Knoxville Division, with office at Knoxville, Tenn., succeeding A. Stewart, promoted. S. R. Richards has been appointed Master Mechanic of the Danville, Charlotte and Asheville Divisions, with office at Spencer, N. C., succeeding J. T. Robinson, resigned.

Texas Southern.—E. B. Couch has been appointed Auditor, with office at Marshall, Texas, succeeding E. B. Sherman, resigned.

Toronto, Hamilton & Buffalo.—G. W. Holmes has been appointed Purchasing Agent and G. W. Wilson, Car Accountant, with offices at Hamilton, Ont.

Union Tank Line.—J. W. Dalman, heretofore Master Mechanic of the Baltimore & Ohio at Newark, Ohio, has been appointed Assistant Master Car Builder of the U. T. L., with headquarters at New York.

West Virginia Central & Pittsburgh.—C. A. Steiner has been appointed Superintendent, succeeding W. H. Bowers, Assistant General Manager, resigned.

LOCOMOTIVE BUILDING.

The Louisville & Nashville is having 55 locomotives built at the Baldwin Works.

The Detroit & Mackinac is having two locomotives built at the Schenectady Works of the American Locomotive Co.

The El Paso & Southwestern is having two locomotives built at the Rhode Island works of the American Locomotive Co.

The Louisiana & Arkansas has ordered eight simple 10-wheel (4-6-0) locomotives from the Baldwin Locomotive Works, for July, 1903, to January, 1904, delivery. The locomotives will weigh 139,085 lbs., with 109,365 lbs. on the drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 56 in.; wagon top boiler, with a working steam pressure of 180 lbs.; 291 iron tubes, 2 in. in diameter and 13 ft. long; steel fire-box, 108 5/16 in. long and 33⅛ in. wide; tank capacity, 5,000 gallons, and coal capacity, 10 tons. The special equipment includes: Westinghouse air-brakes, Franklin boiler lagging, American Steel Foundries couplers, Adams & Westlake headlights, Monitor injectors, Jerome piston and valve rod packings, Leach sanding devices, Standard driving, truck and tender wheel tires.

The Southern Indiana, as reported in our issue of June 26, is having 10 simple 10-wheel (4-6-0) locomotives built at the Baldwin Works for July, 1903, delivery. The locomotives will weigh 134,000 lbs., with 105,000 lbs. on drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 54 in.; extended wagon top boiler, with a working steam pressure of 190 lbs.; heating surface, 2,190 sq. ft.; 290 National charcoal iron tubes, 2 in. in diameter, 13 ft. 7 in. long; fire-box, 72 in. long and 66 in. wide; grate area, 33 sq. ft.; tank capacity, 5,000 gal. Special equipment includes Westinghouse air-brakes, Taylor iron axles, Cook bell ringers, Keasbey & Mattison boiler lagging, Lappin brake-shoes, Tower couplers, Ohio injectors, United States bronze journal bearings, Jerome piston rod and valve rod packings, Ashton safety valves, Leach sanding devices, Michigan sight feed lubricators, Crosby steam gages, Standard driving wheel, truck wheel and tender wheel tires and steel wheel centers.

The Georgia, Southern & Florida, as reported in our issue of June 19, has ordered one simple 10-wheel (4-6-0) locomotive from the American Locomotive Co. for October, 1903, delivery. The locomotive will weigh 149,000 lbs., with 114,000 lbs. on drivers; cylinders, 20 in. x 26 in.; radial stay boiler with a working steam pressure of 200 lbs.; heating surface, 2,496 sq. ft.; 320 iron tubes, 2 in. in diameter and 13 ft. 10 in. long; fire-box, 102 5/16 in. long and 40⅜ in. wide; grate area, 28.65 sq. ft.; tank capacity, 4,500 gal.; coal capacity, 10 tons. Special equipment includes: Westinghouse brakes, steel axles, Keasbey & Mattison magnesia boiler lagging, Sterlingworth brake-beams, Lappin brake-shoes, Leeds reversible couplers, Pyle-National headlights, Monitor No. 10 injectors, Ajax journal bearings, U. S. metallic piston and valve rod packings, Coale safety valves, Leach sanding devices, Nathan sight-feed lubricators, Ry. Steel Spring Co.'s springs, Crosby steam gages and steel wheel centers.

CAR BUILDING.

The American Car & Foundry Co. has miscellaneous orders for 127 cars.

The Guaqui & La Paz has ordered two coaches from the American Car & Foundry Co.

The Pittsburgh & Lake Erie has ordered 10 coaches from the American Car & Foundry Co.

The Cerro de Pasco of Peru has ordered 25 steel hoppers from the American Car & Foundry Co.

The Pennsylvania is having 250 freights built at the Butler Works of the Standard Steel Car Co.

The International & Great Northern has ordered 100 stock cars from the American Car & Foundry Co.

The Butte, Anaconda & Pacific is having 50 freights built at the Allegheny Works of the Pressed Steel Car Co.

The Denver & Rio Grande is having 12 coaches built at the St. Charles Works of the American Car & Foundry Co.

The Atchison, Topeka & Santa Fe is having 100 freights built at the Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.

The St. Louis & Southwestern, as reported in our issue of June 12, has ordered 2,000 freights from the American Car & Foundry Co. These are to be divided equally between the Jeffersonville Works and the Terre Haute Works.

The Mexican International, as reported in our issue of June 19, has ordered 50 coal cars, of 80,000 lbs. capacity, from the Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill., for July, 1903, delivery. The cars will be 36 ft. 7⅝ in. long over end sills, and 10 ft. wide over all, with wooden frames and underframes. Special equipment includes hammered iron axles, steel bolsters and brake-beams, cast-iron brake-shoes, Westinghouse brakes, Babbitt brasses, Janney couplers, Miner draft rigging, cast-iron journal boxes, Morris journal box lids and Mineral paint.

The Virginia & Southwestern has ordered 250 gondolas, of 80,000 lbs. capacity, from the American Car & Foundry Co., for August, 1903, delivery. The cars will be 36 ft. 3 in. long and 8 ft. 6 in. wide over end sills, and 9 ft. 2½ in. wide and 3 ft. 11½ in. high, inside measurement, with wooden frames and underframes. Special equipment includes hammered iron axles, cast-steel bolsters, cast-iron brake-shoes, Westinghouse air-brakes, solid lead-lined brasses, Miner draft rigging, vulcanized fiber dust guards, cast-iron journal boxes, Fletcher pressed steel journal box lids, and arch-bar trucks.

BRIDGE BUILDING.

ALLENTOWN, PA.—The viewers of the bridge proposed over Lehigh River here have reported favorably to the Dauphin County Court, and have recommended a structure 42 ft. wide, to cost about $110,000. There will be about five spans. The State Superintendent of Public Grounds and Buildings at Harrisburg can give information.

AMHERSTBURG, ONT.—Bids will soon be wanted for two steel and cement bridges on the town line between Gosfield and South Woodslee. Address the County Council.

ATCHISON, KAN.—New bids are wanted for two new bridges near the fair grounds. Address the County Commissioners.

BALTIMORE, MD.—The Western Maryland will build a heavy bridge over Wilkens avenue.

BEL AIR, MD.—The Baltimore & Bel Air Electric Ry. will need three steel bridges. Address J. A. Shriver, General Manager, at Wilna, Md.

BELLAIRE, OHIO.—The officers of the Baltimore & Ohio, on June 24, submitted plans to the Bellaire Council for its viaduct in Bellaire to connect with the C., L. & W. The contract will be let as soon as the ordinance is passed.

BRANT, ONT.—Bids are wanted by 6 p.m., July 11, for a steel bridge over Saugeen River. Address Alex. Anderson, Reeve of Brant.

BUCKINGHAM, VA.—Bids are wanted by Wm. Peile, Road Commissioner, July 11, for some bridge work.

BLUFFTON, IND.—Bids are wanted July 15, by W. A. Marsh, County Auditor, for a bridge in Liberty Township.

BUTLER, MO.—Bids are wanted July 5 for three steel bridges on masonry foundations. R. E. Johnson, Bridge Commissioner.

CASTLEWOOD, S. DAK.—Bids are wanted July 10 for a steel bridge. L. H. Ford, County Auditor.

CHATTANOOGA, TENN.—W. A. Garrett, General Manager, Cincinnati, New Orleans & Texas Pacific R. R., is reported as saying that all the bridges on the line between Chattanooga and Cincinnati will be rebuilt.

CHILLICOTHE, OHIO.—Bids are wanted July 13, according to report, for the superstructure of a bridge at State Mills. John H. Miller, County Auditor.

CINCINNATI, OHIO.—Bids are wanted until noon of July 25, by the Board of Commissioners, for building several bridges and doing other work.

DAVENPORT, WASH.—Bids are wanted July 6 for eight steel spans to be placed over different creeks. A. S. Brown, County Auditor.

EAST LIVERPOOL, OHIO.—Joseph W. Craig, of Sewickley, Pa., is interested in three bridges to be built over the Ohio.

EASTON, PA.—The court has been asked to approve of the construction ot a new bridge in Upper Mt. Bethel Township.

ELBA, N. Y.—Quite a number of steel bridges will be built on a new road. Address Town Clerk Sanderson.

FAIRMONT, MINN.—Bids are wanted July 13 for building a 150-ft. steel bridge. H. P. Edwards, County Auditor.

FALL RIVER, MASS.—The Legislature has authorized the bridge over Taunton River, between Fall River and Somerset.

FITCHBURG, MASS.—The State has authorized a bridge at Morrison street. Address the City Engineer.

GREENVILLE, S. C.—The county has appropriated $15,000 for repairing bridges damaged by recent floods.

HEMPSTEAD, TEXAS.—The Houston & Texas Central will build a 930-ft. steel bridge over Brazos River.

INDIANAPOLIS, IND.—The Indianapolis & Northwestern Traction Co., according to report, will build a bridge over Fall Creek at Northwestern avenue.

KENNEWICK, WASH.—Bids will be wanted some time in July by W. D. Newcomb, County Auditor, North Yakima, for a 320-ft. combination bridge over Yakima River.

LAWRENCE, KAN.—The Union Pacific is about to build a new bridge over Kaw River at Lawrence.

MCKEESPORT, PA.—In addition to the bridge to be built over White's Hollow on Versailles avenue, by the Pittsburgh, McKeesport & Connellsville Ry., it is said that this company will build an 800-ft. viaduct near Riverton. Address A. E. Hess, Chief Engineer, Connellsville, Pa.

MARYSVILLE, WASH.—Bids are wanted by the County Commissioners for a steel bridge over Allen River near Marysville.

MONTESANO, WASH.—Bids are wanted July 6 for a trestle over Hamilton gulch. W. D. Campbell, County Auditor.

MONTICELLO, IND.—Bids are wanted July 8 for seven steel and stone bridges. Address the County Commissioners.

MISHAWAKA, IND.—New bids are wanted July 21 for the 375-ft. bridge over St. Joseph River at Cedar street. John M. Brown, County Auditor.

NEWPORT, IND.—Bids are wanted July 6 by the County Commissioners for some bridge work. Wm. P. Bell, County Auditor.

OKLAHOMA CITY, OKLA. T.—Bids are wanted July 27, by E. S. Blackburn, County Clerk, for building three bridges, each of 50-ft. span, bidders to furnish plans and specifications.

OMAHA, NEB.—The bids received May 21 for the viaduct over Central Boulevard at 34th street, were rejected as exceeding the estimate. There is no prospect of asking bids again.

PITTSBORO, N. C.—The Commissioners of Chatham County have ordered specifications made for a bridge over Haw River which, we are told, will be a long and high structure, perhaps of five stone arches.

PORTLAND, ORE.—The bridge at Morrison street over Willamette River, for which $400,000 bond issue has been authorized, will consist of three truss spans and a draw span. Plans are being made. W. C. Elliott, City Engineer.

Plans are reported made for a steel bridge over Sullivan gulch and bids are wanted.

ROCKVILLE, IND.—Bids are wanted July 9 for the steel superstructure of some bridges. J. H. Kerr, County Commissioner.

ST. PAUL, MINN.—The city bridge engineer is making plans for a steel bridge at Happy Hollow, to cost $12,000.

SCRANTON, PA.—Common Council has passed on third reading the $41,000 bond ordinance providing for the bridges at Sanderson avenue and Ash street.

STOCKTON, CAL.—Bids are wanted July 7 for a steel bridge over Mokelumne River near Woodbridge. Address the County Clerk.

STROUDSBURG, PA.—The viewers for the State have reported in favor of a bridge between Stroudsburg and East Stroudsburg, across Broadhead's Creek, at a cost of $60,000.

SUNBURY, PA.—The viewers for the State have recommended a bridge over Shamokin River near Sunbury, at a cost of $12,000.

TAMPICO, MEXICO.—A report says that $94,770 has been authorized by the Mexican Congress for a viaduct in Tampico.

TOPEKA, KAN.—The City Railway Co. will build a bridge over Kansas River.

VANCOUVER, B. C.—The Department of Railways and Canals is reported to have approved plans for a bridge over False Creek by the Great Northern Ry., on an extension.

VINITA, IND. T.—Three bridges are proposed here to be paid for by private subscription.

Other Structures.

ALBEMARLE, N. C.—The machine shop of R. L. Sibley & Co., destroyed by fire on June 3, will be rebuilt at once on a large scale.

ALIQUIPPA, PA.—The Vulcan Crucible Steel Co. will build an extension to the melting department.

BUTLER, PA.—A 300-ft. addition will be built to the main building of the Standard Steel Car Works.

DOVER, N. J.—The control of the Dover Iron Co. is now with Cadwallader R. Mulligan, formerly General Manager of the furnace, and it is said it will be enlarged.

FORT WAYNE, IND.—The Fort Wayne Iron & Steel Co. is about to build a plant here. Address J. T. Evans.

HUNTINGTON, IND.—The Wabash R. R. is said to have plans under way for a new passenger station here.

LANCASTER, PA.—The Philadelphia & Reading, which in recent years has been rebuilding many passenger stations, will build a new station at Prince street in Lancaster. Another will be built at Auburn, for which bids were received some time ago.

MEMPHIS, TENN.—I. F. Peters, President of the Industrial League, is interested in the Memphis Bridge Co., recently organized to do a bridge building business. Shops will be built here.

MONTREAL, QUE.—Wm. Jessop & Sons, Ltd., of Sheffield, Eng., have made arrangements to build a furnace in Canada to make fine steel. The New York office is 91 John street.

NEW ORLEANS, LA.—The New Orleans Ry. Co. is planning to build an extension to the car shop on Canal street.

NEW YORK, N. Y.—Sealed proposals will be received by H. Fernstrom, Chief Engineer, at 3 p.m., July 8, for the delivery and erection of smoke flues, economizer settings and rear boiler walls at the Weehawken power station on the River Division of the N. Y. C. & H. R. R. R.

PITTSBURG, PA.—Local reports state that a contract to build the new Baltimore & Ohio passenger station at Smithfield street will be let as soon as certain ordinances are passed by the Councils. The plans for this structure have been ready for some time. The station will be seven stories high, with a frontage of 75 ft. at Smithfield street, and a depth of 110 ft. on Water street.

SALT LAKE CITY, UTAH.—It is announced that a new concern known as the Utah Iron & Coal Co., having acquired 500,000 acres of iron ore lands in Utah, will build a steel plant and build a line of railroad.

WHATCOM, WASH.—The city has granted franchises to the Great Northern to build a passenger station and a large freight house in the center of the city. The work is to be undertaken at once and finished within 12 months at a cost of $10,000 for each building.

WILMINGTON, DEL.—There are now 14 buildings finished or being built for the new shops of the Pennsylvania R. R. at Todd's Cut, and it is said that contracts for six more buildings will be let in the near future.

WINNIPEG, MAN.—Wm. McKenzie, President of the Canadian Northern Ry., in a recent interview intimated that there is a possibility of the shops at Winnipeg being enlarged.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALASKA CENTRAL.—Contracts for building this line have been let to the Seward Construction Company of Chicago. The proposed route is from Resurrection Bay northward to the Tanana River, 150 miles. The contract calls for the completion of the first 25 miles by the end of 1903. G. W Dickinson is president of the new company.

ARKANSAS, MISSOURI & KANSAS.—Contracts are reported let for the first 25 miles of this proposed road from Chanute, Kan., southeast via Joplin, Mo., to Memphis, Tenn. W. D. Spooner, Joplin, Mo., is Chief Engineer. (March 20, p. 219.)

ATCHISON, TOPEKA & SANTA FE.—Approximately a month ago the flood damage was roughly estimated at $100,000. An officer is now quoted as saying that the ultimate cost to repair all damage done will probably reach $500,000. The lines are now all open to traffic. (June 5, p. 400.)

ATLANTA, KNOXVILLE & NORTHERN.—Bids are now being asked by this company for regrading the line from Knoxville to Hiwassee River, 70 miles. The resurveying of the line has been directed under the supervision of the chief engineer of the Louisville & Nashville. It is reported that the remaining portion of the road to Marietta will also be regraded as soon as the surveys are finished.

BALTIMORE & BEL AIR (ELECTRIC).—An officer writes that the contract for grading, etc., will be let in the near future for this projected line between the points named in Maryland. The distance is 18 miles. The work involves three steel bridges. S. A. Williams is President, and Vandevanter & Hood, Equitable Bldg., Baltimore, Md., are the engineers.

BALTIMORE & OHIO.—An officer writes that this company proposes to build third and fourth tracks between Wheeling Junction and McKeesport, Pa., but that no work has been done as yet. Rights of way are practically all secured. (June 19, p. 449.)

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Contracts are reported let for a cut-off 18 miles long between Lawrenceburg Junction and Sunman, Ind., which will shorten the main line a mile, and take out a heavy grade which at present exists. The work involves 16 concrete bridges, and the estimated cost is $1,500,000. The contract calls for completion by May 1, 1904. Press advices do not state the name of the contractor.

DOUGLAS & SAVANNAH SHORT LINE.—This company has made application for a charter to build from Douglas, Ga., northeast to Savannah, 120 miles. Branches are proposed to Valdosta and Reidsville. D. G. Purse, J. C. Rowland and E. M. Frank, of Savannah; J. S. Lott and W. W. McDonald, Douglas, are incorporators.

DULUTH, SUPERIOR & WESTERN TERMINAL COMPANY.—This company has filed articles of incorporation in Wisconsin to build wharves, docks, warehouses and railroads in Wisconsin, Minnesota and Canada. It is organized under the laws of West Virginia. Portland Betts, Frank H. Church and others, of Madison, Wis., are the incorporators.

EASTON & BELVIDERE (ELECTRIC).—Contract has been let to the Railway Construction Co. of America, with offices in the Exchange Bldg., Boston, Mass., to build this projected line from Nazareth, Pa., to Belvidere, N. J., a distance of about 43 miles. Chas. A. Richardson, Boston, Mass., is General Manager.

FARMERVILLE & SOUTHERN.—Contract has been let to W. H. Dennison, Farmerville, La., for grading the first five miles of this road. The proposed route is from Farmerville, La., in a northeasterly direction to Lake Landing, Ark., 26 miles. (May 15, p. 352.)

LANCING-SOUTH PITTSBURG.—Work is reported begun on this projected line from Lancing, Tenn., on the Cincinnati, New Orleans & Texas Pacific, to South Pittsburg, Tenn., on the Jasper branch of the Nashville, Chattanooga & St. Louis, 90 miles. The proposed line will cross Cumberland County, connecting with the Tennessee Central at a point eight miles west of Crossville. (June 19, p. 450.)

MABOU & GULF.—Bids are now being asked for building this proposed railroad from a point on the Inverness & Coal Company's line to a point on the Intercolonial at Orangedale, 34 miles. J. Boardman Cann, Mabou, Cape Breton, N. S., may be addressed. (See Construction Supplement.)

MANITOU & PIKE'S PEAK.—Press reports say that this line will be extended from the summit of Pike's Peak, Colo., to Victor, nine miles. The estimated cost is in the neighborhood of $750,000, owing to the great engineering difficulties. C. W. Sells, Manitou, Colo., is Manager.

MASONTOWN & NEW SALEM.—An officer denies that this company is planning to build an extension from New Salem to Brownsville, Pa.

MEMPHIS & CHARLESTON (SOUTHERN).—It is reported that this company will build an extension from Stevenson, Ala., northeast to Chattanooga, Tenn., 30 miles. The present terminus of the road is at Stevenson, and from that point the M. & C. trains come into Chattanooga over the Nashville, Chattanooga & St. Louis. Surveys are reported completed for the new route.

MEXICAN CENTRAL.—It is reported that this company is about to build a branch from Gallego to Cananea, in the State of Chihuahua, Mexico, 100 miles. The mines and smelter of the Green Consolidated Copper Co. are situated near Cananea. Surveys are now reported in progress.

MEXICAN ROADS.—A concession has been granted by the Mexican Government to W. C. Hooll, representing an English syndicate, to build and operate a railroad from Guadalajara, Mexico, to San Ignacio.

The Mitchell Copper Co. is building a railroad from its mines at La Diche, in the State of Guerrero, to the port of Acapulco, on the Pacific Coast, 60 miles. The road will probably be operated by electricity.

MIDLAND VALLEY.—Contracts for grading this railroad from Fort Smith, Ark., in a southeasterly direction via Greenwood to Hartford, 53 miles, are reported let to J. B. Starker, Ada, Ind. T., and to Manie Bros., Chattanooga, Tenn. Work is to be begun near Hartford at once. The new road will parallel the Arkansas Central between Fort Smith and Greenwood. F. A. Molitor, Fort Smith, is Chief Engineer. (June 19, p. 449.)

NATCHEZ & GULF.—Surveys are reported completed for this new line which is projected to run from Natchez to Gulfport, Miss., by way of Washington, Hamburg, Meadville, Magnolia and Poplarville, a distance of about 125 miles, through the Pearl River lumber district. W. Hungerford, Gulfport, Miss., is Chief Engineer. (See Construction Supplement.)

NATIONAL R. R. OF MEXICO.—Press reports state that this company has let a contract to Captain Wm. Smith, Monterey, for grading the proposed extension from Monterey to San Miguel, 120 miles. It is reported that a large part of the work will be sub-let.

NEW ORLEANS & SOUTHWESTERN.—The capital stock is said to have been increased from $1,500,000 to $4,000,000 at a recent meeting of stockholders, to provide for an increase in the length of the road from 74 miles to 120 miles. It is expected that grading will be started within the next 60 days.

NEW YORK CENTRAL & HUDSON RIVER.—At a joint meeting of the directors of this company, and the directors of the New York & Harlem R. R. on June 30, the agreement with the city of New York for depression of the tracks in the Grand Central yards, and for abolition of the use of steam as motive power, was approved.

NORFOLK & WESTERN.—Contract has been awarded to Serpell & Co., Louisville, Ky., for building a second track from Davy southeast to Welch, W. Va., 12 miles. The work will take about two years, and includes nine tunnels and four bridges. The new survey will shorten the distance by more than two miles. (March 13, p. 204.)

OHIO & MICHIGAN TRACTION.—This company has been incorporated in Michigan, with a capital stock of $1,650,000, for the purpose of building an electric railroad from Toledo, Ohio, north to Ann Arbor, Mich., passing through the Counties of Monroe and Washtenaw, and the towns of Petersburg, Dundee and Milan. J. B. Foraker, Cincinnati; M. I. Wilcox, Toledo; H. C. Stahl, Bellevue, Ohio, and M. C. Briggs, Fostoria, Ohio, are incorporators.

PENNSYLVANIA.—Press reports state that a contract has been awarded to Millard & McGraw for the grading and masonry work in connection with the elevation of the tracks through Bristol, Pa., on the New York Division. The contract calls for the completion of the work by Dec. 31, 1903. An entirely new line will be built through Bristol, passing some 1,800 ft. to the northward of the present station.

The construction of the tunnel under the Hudson River and across Manhattan Island was begun on June 26, when a force of men began drilling the shafts at Thirty-second street, Manhattan. The work will be in two divisions, one from Ninth avenue and Thirty-second street westward, and the other eastward, which includes the approaches to the station. Work at the New Jersey entrance to the tunnel west of Bergen Hill will be begun in a few weeks.

PEOPLE'S RAPID TRANSIT.—A contract for grading the proposed extension of this road from Napoleon, Ohio, to Defiance, 50 miles, has been awarded to Morrison, Fowler & Scott. It is proposed to build eventually from Cincinnati to Toledo, 220 miles, passing through Hamilton, Greenville, Celina, Paulding, Defiance and Napoleon. W. P. Heston, Adam Burger and C. F. Clay, Napoleon; J. C. Diehl, Defiance; O. K. Dickinson, Paulding, and others are directors.

PITTSBURGH & LAKE ERIE.—Announcement has been made that a portion of the extension south from Fayette City, Pa., toward Brownsville, has been opened. The remainder of the distance is expected to be ready for operation before the first of August.

ST. LOUIS, BROWNSVILLE & MEXICO.—Contract has been let to Johnstone Bros., St. Elmo, Ill., for grading this proposed road from Sinton, Texas, south to Brownsville, 200 miles. Work will be begun at once. Uriah Lott and C. C. Kleberg, Corpus Christi, Texas, are said to be interested. This road is supposed to be a Rock Island-Frisco project. (June 12, p. 416.)

SAUCON VALLEY.—A charter has been granted to this company in Pennsylvania to build a steam railroad from a point on the Lehigh Valley in Northampton County, Pa., to a point on the North Penn branch of the Philadelphia & Reading in Lower Saucon Township, Northampton County. E. M. McIlvain, Fountain Hill, Pa., is President.

SOUTHERN PACIFIC.—Preliminary surveys are reported for a projected branch of the Gulf, Western Texas & Pacific, one of the Southern Pacific Texas lines running from Placido to Hynes Bay, a distance of about 30 miles.

TOLEDO & OHIO CENTRAL.—It is said that the West Columbus yards of this company will be doubled in the near future. The plans involve six new tracks, and the estimated cost of the work is about $30,000.

TOLEDO & SPRINGFIELD.—This company is to be organized in Ohio as a subsidiary company to the Detroit Southern. An extension is projected from Hamler northeast to Toledo, 40 miles. Connection will be made with the Baltimore & Ohio at Hamler.

UNION PACIFIC.—An officer writes that the report that work has been begun on the Athol cut-off between Cheyenne, Wyo., and Eaton, Colo., is false. No such work is contemplated at present.

VIRGINIA R. R.—An officer writes that surveys are practically finished and rights of way secured for the 110 miles of this road from Rosney, Va., to Danville. Contracts for grading will be let this fall. Wm. Ingles, Bradford, Va., is Chief Engineer; K. T. Crawley, Farmerville, Va., is President. (See Construction Supplement.)

WISCONSIN & MICHIGAN.—Press reports say that an extension will be built from Twin Creek, Mich., to the Lake Noquay Bay lumber regions, in the interest of the Peshtigo Lumber Co., the grading to be done by the lumber company, and the superstructure to be built by the railroad. B. C. Gowen, Peshtigo, Wis., is Chief Engineer.

GENERAL RAILROAD NEWS.

GAINESVILLE, JEFFERSON & SOUTHERN.—Judge Kimsey, of the Northeastern Circuit Court of Georgia, handed down a decision on June 17 in favor of the city of Gainesville, in its suit as stockholder against the Gainesville, Jefferson & Southern and the Georgia Railroad. The decision makes invalid $145,350 of the $161,500 first mortgage 7 per cent. bonds issued by the Gainesville, Jefferson & Southern to the Georgia R. R. in 1883. The rate at which the bonds were received by the Georgia R. R. was held usurious, and, in consequence, $145,350 of the bonds and the interest thereon for 20 years, amounting to about $225,000, are declared invalid and uncollectable. The case will probably go to the Supreme Court. The city of Gainesville subscribed for $50,000 of the stock.—*Commercial and Financial Chronicle.*

GOSHEN & INDIANA TRACTION.—This company, which was incorporated to build an electric line from Goshen to Angola, Ind., has changed its name to the Northern Indiana. It has also filed a mortgage to the Colonial Trust Co. of Pittsburg, trustee, to secure $3,500,000 50-year bonds.

NATIONAL R. R. OF MEXICO.—Notice is given by James Speyer, Jacob H. Schiff and Edgar Speyer, the voting trustees of the National R. R. of Mexico, that the voting trust has been dissolved. The trust was formed March 15, 1902, and on July 27 certificates of preferred and common stock will be exchanged for all stock certificates that are surrendered. Speyer & Co., in New York and London, and Teixeira de Mattos Bros. at Amsterdam, will receive the stock trust certificates in exchange.

NORFOLK & WESTERN.—First consolidated mortgage 4 per cent. coupon bonds of 1996, to the amount of $2,000,000, have been listed by the New York Stock Exchange, making the total amount listed to date $36,210,500. The new bonds will be applied to payment of car trust certificates and bonds acquired, and for building a number of short branch lines and making other betterments.

ROCK ISLAND COMPANY OF NEW JERSEY.—Announcement is made of the purchase of one-half of the capital stock of the Houston & Texas Central, with total stock of $10,000,000; the Houston, East & West Texas, with total stock of $1,920,000, and the Houston & Shreveport, with total stock of $400,000. Payment for the same will be made by delivery of $1,500,000 cash, $2,500,000 preferred stock of the Rock Island Co., and $3,500,000 in Rock Island notes, payable five years after April 1, 1903, with interest at the rate of 4 per cent.

SAN ANTONIO & ARANSAS PASS.—In the *Railroad Gazette* of June 12, page 416, was recorded the order of the Texas State Railroad Commission to the above company, requiring it to cancel $1,700,000 of bonds alleged to have been issued illegally; also to reduce its capital stock from $5,000,000 to $1,000,000. At a recent meeting of the directors of the railroad, the order of the Commission was accepted and a counter proposition was made to the effect that if the Commission would permit the bonds and stock to stand, the railroad would build an extension approximately 150 miles long to Brownsville, Texas, and utilize the bonds and stock in question on the extension. Press despatches state that the Railroad Commission has refused to accept this new proposition. This leaves the railroad until Sept. 1 to comply with the previous order.

TEXAS & PACIFIC.—A contract has been filed with the Texas Railroad Commission, in accordance with which the Texas & Pacific will allow the St. Louis & Southwestern to run its passenger trains over its line from Fort Worth to Dallas, on consideration of 40 cents per passenger train mile for each train operated, over the 32 miles of road. There are no consolidation or merger features in the agreement. The contract became effective from May 15, 1903, and each contracting party has the right to cancel it by giving 90 days' notice of its intention to do so.